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THE PAN-PACIFIC ENTOMOLOGIST

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Vol. XXX January, 1954 No. 1

HOWARD MADISON PARSHLEY

1884–1953

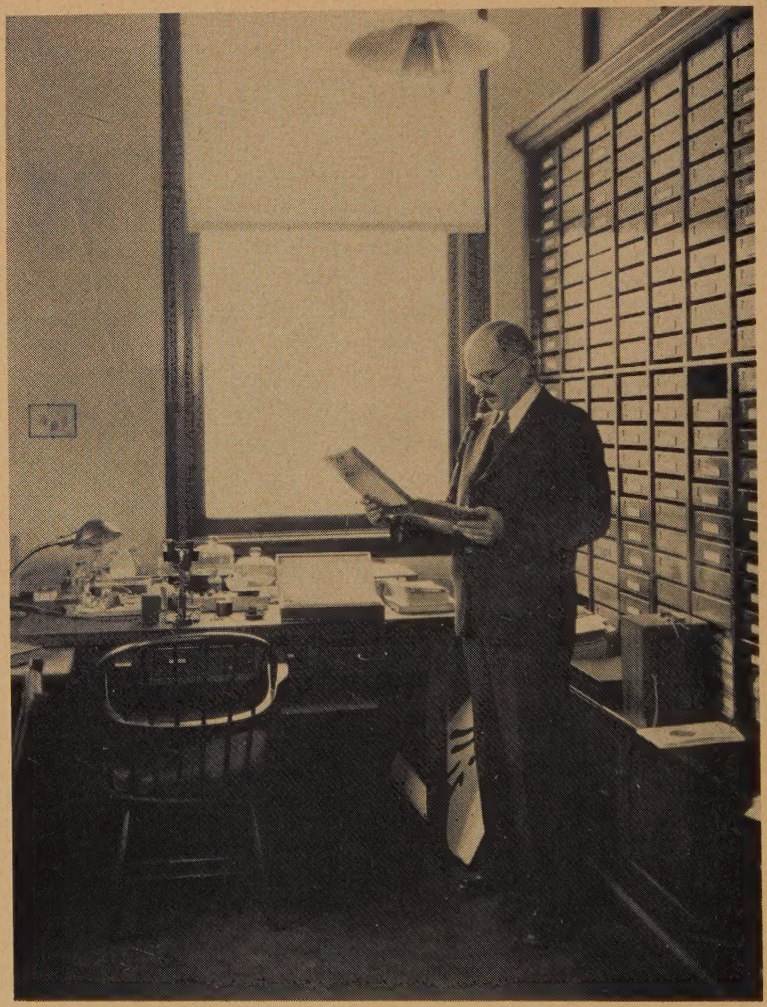
ROBERT L. USINGER

University of California, Berkeley

The passing of Howard Madison Parshley on May 19, 1953, brought to a close the earthly career of one of the most versatile hemipterists of our time. Born in Hallowell, Maine, on August 7, 1884, Dr. Parshley spent his early teens on a farm in eastern New York State. "This experience," to quote from a biographical sketch by Dr. Alexander Leslie in the Smith College Memorial Service, "gave him insight into country life, and, with the help of a tattered Cornell leaflet on insect collecting, probably determined the direction of his major professional interests.

"Dr. Parshley attended the Boston Latin School from 1901 to 1905. He then went to Harvard University from which he was graduated in 1909. During the period of 1906 through 1909, he also attended the New England Conservatory of Music. In 1910, he took his master's degree from Harvard. At this time he was married to Nancy Fredricson. They went to the University of Maine where for three years he was instructor in biology, the exact position which his daughter, Elsa, was to fill some years later. In 1914 he returned to Harvard, where he was awarded his Doctor of Science degree in 1917. That same year he received an appointment in the zoology department of Smith College, where he was to complete his life's work."

It would be quite impossible and out-of-place to try to cover the whole of Dr. Parshley's varied career in this brief article. His published articles and reviews alone exceed 400. He was an accomplished musician, playing at the first stand in the bass section of the Springfield Symphony Orchestra for many years. Additional interests included poetry, radio technology, sports and gardening, but his music was particularly close to his heart, and provided a fitting climax to his career only a week before his death. May 13th was Northampton's first "Symphony Day" when the Springfield Symphony came to town to play for 2,000 school children in the afternoon and for the community as a whole in the evening. He demonstrated the double bass for the children in a way which



brought the house down. He was first bass for these concerts and was especially interested in the event as his daughter was chairman of the whole affair.

At the time of his death, Dr. Parshley had completed arrangements for the disposition of his insect collection and entomological library. The collection of 23,980 specimens was sold to the California Academy of Sciences, to take its place beside that of his colleague of former years, E. P. VanDuzee. It is interesting to note that the collection contains specimens taken as recently as 1947,

long after his last publication on insects. The collection alone would be an impressive monument to a life's work, including, as it does, numerous type specimens, beautifully prepared specimens of typical European species and the definitive collection of Geocorinae of the world which was purchased from A. L. Montandon in 1920. But Dr. Parshley's entomological contributions were far greater than this. In the brief span of years from 1914 to 1925, fifty-three papers were published, dealing principally with the Aradidae, Tingidae, Miridae, Gerridae, Veliidae, Nabidae, Lygaeidae and Anthocoridae. His greatest taxonomic work was the "Essay on the American Species of Aradus," published in 1921. This is still the definitive work on this subject and could well serve as a model in style and thoroughness of treatment for future students in this and other groups.

Without doubt, his greatest service to hemipterology was his "Bibliography of the North American Hemiptera—Heteroptera," (1925) a carefully prepared and beautifully printed fiftieth anniversary publication of Smith College. His interest in the bibliography of the Hemiptera led to his appointment as managing editor of the General Catalogue of the Hemiptera. This project was organized by a group of hemipterists at the Cincinnati (1923) meeting of the American Association for the Advancement of Science. The Catalogue was published by Smith College, five fascicles having appeared in 12 parts (2,177 pp.) between 1929 and 1949. It is certainly not accidental that this Catalogue, under Dr. Parshley's guidance, stands as the most complete (for the comparatively small number of families dealt with) and faultlessly prepared catalogue of any group of insects to date.

Dr. Parshley's publications on the Hemiptera were not numerous, and covered only a brief decade ending over a quarter of a century ago, his travels were not extensive, and his personal contacts with fellow hemipterists were few. How then does it happen that his influence was so great? The answer lies in his scholarly approach and his penetrating mind. It is evident from his publications that Dr. Parshley understood the fundamentals of biology. Therefore his judgment was good in matters of classification, nomenclature and distribution. That he also understood human nature and the basic essentials of human life is evidenced by his extensive writings, particularly since 1925, in the social sciences.

There is no need to repeat the list of enomological publications given by Dr. Parshley himself in the "Bibliography" (1925), but a few quotes from his writings on Hemiptera will serve to illustrate Dr. Parshley's philosophy and at the same time may provide the general entomologist, who might otherwise overlook these buried treasures, with food for thought. Dr. Parshley—"On the Preparation of Hemiptera for the Cabinet" (1919)—deplores the "practical spirit which eliminates the study of the classics, elevates every trifling trade to the dignity of an academic pursuit, and in general places the things of the dollar above the things of the spirit. The science of entomology has reached its present state of advancement very largely through the unpaid effort, the labor of love, of enthusiasts, and we may hardly look for any progress that is worthwhile, in the technique of mounting specimens or in matters of higher import, if entomologists, professional or otherwise, come to be actuated as a class by any spirit other than that of the true amateur."

Dr. Parshley's keen mind saw through the superficialities of some of the work of his contemporaries and led him into a controversy which, both in correspondence and in spirit, was devastatingly logical, stimulating, and at all times, dignified. His views on subspecific variation, expressed 30 years ago, were well ahead of their time and his remarks on "criticism" in a biographical article on "Ernst Evald Bergroth: Master Hemipterist (1857–1925)" are perhaps more pertinent today than at the time they were written. "It is . . . in this . . . field . . . of fiery and often magnificently destructive criticism, that Bergroth did some of his most important work. The sanative influence he exerted and will continue to exert upon beginning students—through his attacks on ignorant and careless workers, and his lively appreciation of thorough and honest effort—will prove to be not the least valuable element in his enduring contribution. No student can afford to neglect the study of Bergroth's masterpieces in the art of controversy; for when mutual criticism fails, science loses one of its most essential means of progress."

In his article "On the Life of William T. Davis," Dr. Parshley stated his concept of the problem of living, a problem which, in retrospect, it would appear that he solved so successfully. "He (referring to Davis) solved in his fashion the problem all must face: how at once to follow the inner light, meet the material demands of life, and maintain a genial warmth in human relations."

PARASITES OF CITRICOLA SCALE IN JAPAN, AND THEIR INTRODUCTION INTO CALIFORNIA[1]

J. LINSLEY GRESSITT,[2] STANLEY E. FLANDERS,[3]
AND BLAIR BARTLETT[4 5]
University of California Citrus Experiment Station, Riverside, California

Citricola scale in California, described by Campbell in 1914 as *Coccus citricola,* was subsequently shown to be the same species as that from Japan, described by Kuwana earlier in the same year as *Lecanium pseudomagnoliarum.* Rules of scientific nomenclature require the use of the species designation first applied; hence, the adoption of the name *Coccus pseudomagnoliarum* (Kuwana), and the retention of the term citricola for the common name of this scale.

The citricola scale is a major pest of citrus in central California, and infestations sporadically become severe in many of the inland citrus areas, from Butte County in the north to the Imperial Valley in the south. Because of the general restriction of economic infestations of citricola scale to areas of extremely high summer temperatures and low humidities, and its foreign origin, the occurrence of this scale in the climatically dissimilar area of Japan appears as an anomaly. Accumulative evidence that citricola scale is not indigenous to Japan has been supported, also, by other biological evidence relative to its host preferences and parasitic fauna. Its recently reported occurrence at subeconomic levels on citrus in Iran (Kaussari, 1946) further supports the belief that it may be native to the drier areas of Asia, and that it found its way to California by a circuitous route, through Japan.

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[1] Paper No. 770, University of California Citrus Experiment Station, Riverside, California.

[2] Temporarily employed, 1947-1951, by the University of California for investigation of natural enemies of citrus insects in Asia. Now with the B. P. Bishop Museum, Honolulu, T.H.

[3] Professor of Biological Control and Entomologist in the Experiment Station.

[4] Assistant Entomologist in the Experiment Station.

[5] The authors acknowledge their indebtedness to their colleague, Harold Compere, who identified all the parasites mentioned in this paper.

Records of the Department of Biological Control of the University of California on the occurrence of natural enemies of citricola scale in Japan begin with the year 1922. At that time, C. P. Clausen, while exploring the Far East for the Federal Government in connection with another problem, sent to California shipments of citricola scale which yielded the parasites *Coccophagus yoshidae* Nakayama, *Coccophagus japonicus* Compere, *Anicetus annulatus* Howard, and *Metaphycus orientalis* Compere (Compere, 1924). None of these species was received in condition for establishment in California at that time. Subsequent records (Compere, 1926; Flanders, 1942) indicated that *Aneristus ceroplastae* Howard and *Microterys okitsuensis* Compere were possible citricola parasites. The attack upon citricola scale in California by the imported parasite species *Coccophagus caridei* (Brèthes), *Metaphycus stanleyi* Compere, and *Metaphycus helvolus* (Compere), aiding in the work of the previously established *Metaphycus luteolus* (Timberlake) and *Coccophagus lycimnia* (Walker), has been reported by Flanders (1942).

In 1951 an opportunity was afforded the senior author to complete the introduction of citricola parasites from Japan, as well as to survey the area for other possible beneficial insects for use against pests of California agriculture. After obtaining his release from internment by Chinese on the Asiatic mainland, where he had been employed in a search for red scale parasites, he spent the period from February through June, 1951, in Japan, in a search for citricola parasites. The area from northernmost Honshu to southernmost Kyushu was covered in the search.

In this brief exploration, citricola scale was found to be relatively rare in Japan. It was taken from cultivated citrus in only a few isolated plantings, the trifoliate orange, *Poncirus trifoliata*, serving as primary host for the species. On this commonly used Japanese hedge plant, citricola scale was found to be sporadically distributed throughout the warmer half of Japan and somewhat more generally distributed in the cooler northern and central mountainous parts of the country.

In Japan, as in California, citricola scale has only one well-defined generation a year. This even-broodness is of considerable interest, in view of the fact that on potted citrus in outdoor cloth cages at Riverside this scale exhibits an uneven double-brooded-

ness. Even-broodedness under natural conditions represents a distinctly disadvantageous condition for the successful operation of parasitic species, since it is not conducive to their perpetuation during periods when host size is unsuitable. Under such conditions, a complement of alternate hosts is generally required, unless unusual modifications in the life history of the host or its parasites occur. In Japan the possible alternate hosts of the lecaniine group were varied and abundant, a fact that made ready recognition of certain parasitized stages of citricola difficult. It was often impossible to determine whether parasitized individual scales were the species sought or a closely related species.

In Japan there is a somewhat greater disparity in the developmental stages of citricola scales of the warmer and colder areas than commonly occurs in California. There was approximately two months' difference between the beginning of spring scale growth in northern and southern Japan. This inequality of growth served to extend the range of scale development that could be surveyed for parasites during the period of explorations. It fortunately permitted the search for parasites to cover a portion of that period when the scale is in a characteristically colored hibernating or nongrowth period. Since none of the known parasites of citricola attack this stage, and since it offers the greatest possibilities for continued parasite reproduction, emphasis on exploration of this scale stage was most desirable.

Citricola scale is believed to be under effective biological control in Japan. The densest populations discovered were observed as they decreased in abundance and as parasitization approached 100 per cent. It is believed that in isolated localities the scale population may be nearly exterminated by the action of parasites, and that two or more years may be required for attainment of another peak population density. This effectiveness of parasitization is probably correlated with the existence of an abundance of closely related alternate host scales which serve to perpetuate the parasites over unfavorable citricola stages. Such reasoning is further substantiated by laboratory tests on the imported parasites at Riverside, which indicate wide range in host species.

Sixty-one shipments of parasitized citricola scale were received at Riverside from Japan. These were processed through quarantine, and secondary parasites of the genera *Cerapterocerus*, *Tetrastichus*, *Cheiloneurus*, and *Thysanus* were eliminated.

The following five chalcidoid species, all known as citricola parasites, were obtained: *Coccophagus japonicus* Compere, *Coccophagus yoshidae* Nakayama, *Coccophagus hawaiiensis* Timberlake, *Microterys okitsuensis* Compere, and *Anicetus annulatus* Howard. In addition, *Microterys flavus* (Howard), *Metaphycus* sp., *Aneristus ceroplastae* Howard, *Blastothrix ozukiensis* Ishii, *Coccophagus ishii* Compere, and an unrecognized yellow *Coccophagus* were taken from indeterminate host material. Some of the last-named species are still being tested for possible use against other lecaniine scale pests in California. No effective predators of citricola scale were found in Japan. *Chilocorus tristis* Faldermann appeared as an incidental predator, much as do the few ladybird species sometimes observed in California.

The five primary citricola scale parasites from Japan were responsive to culture on soft (brown) scale in the insectary. This greatly simplified production for citricola liberation. All five species were easily distinguishable by their effects on the appearance of the host. *Coccophagus japonicus* attacks scales 1.0–2.0 mm. in length and colors the derm on the dorsum of the scale jet black. *C. hawaiiensis* attacks scales 1.6–2.5 mm. in length and imparts only a slight brownish tinge to the scale derm after emergence. *Anicetus annulatus* attacks scales 1.3–2.4 mm. in length and partially blackens the derm on the dorsum of the scale. *C. yoshidae* attacks scales 1.7–3.0 mm. in length and turns the scale derm dark brown. *Microterys okitsuensis*, the only one of the five that is gregarious, attacks scales 1.5 mm. in length as a solitary parasite, whereas 3 or 4 parasites may attack and emerge from a larger single scale, leaving it in a honeycombed-cocoon condition. The meconia of the five species also present differences which are useful in distinguishing the work of the various species.

Reproduction and liberation of the five primary parasites of citricola scale have been completed. Their release against other lecaniine hosts remains to be tried. Over 25,000 females of *Coccophagus japonicus*, 2,000 of *Microterys okitsuensis*, 20,000 of *C. hawaiiensis*, 3,000 of *Anicetus annulatus*, and 3,000 of *C. yoshidae* have been liberated, primarily in the central California area. The first three species have been recovered from places of liberation. The best prospects for effective control are offered by the species *C. japonicus*, providing this species can bridge the stage of scale unsuitability. Its attack on the smaller scales is advantageous, in

that individuals of a suitable size for attack are available for a longer period.

Only one female specimen of *Metaphycus orientalis* was obtained in the Japanese exploration. It could not be propagated in the insectary. The habits of this parasite, as judged from records of 1922, indicate that it may be an effective parasite of overwintering citricola. Possibilities of acquiring this parasite from Japan are being investigated by the Department of Biological Control.

Summary

During the first half of 1951, a search was made in Japan by the Department of Biological Control of the University of California for parasites of the citricola scale, *Coccus pseudomagnoliarum* (Kuwana). The population of this scale is very low throughout Japan, and on *Poncirus trifoliata*, its preferred host plant, it appears to be under effective biological control.

Coccophagus japonicus Compere, *Coccophagus yoshidae* Nakayama, *Cocophagus hawaiiensis* Timberlake, *Microterys okitsuensis* Compere, and *Anicetus annulatus* Howard were reared from citricola scale collected in Japan and sent to California. (No effective predators were found.) Parasites were studies with regard to host stages attacked, and were liberated in central and southern California. The first three species listed above have been recovered from places of liberation.

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THE SYNONYMY OF THE ANT APHAENOGASTER LEPIDA WHEELER

In 1929, only a few months after Menozzi had applied the name *Aphaenogaster silvestrii* to ants collected in Florida, Wheeler described in the same journal a Formosan homonym. In March, 1930, Wheeler corrected his homonym, which then became *A. lepida*. Unfortunately, both Menozzi and Creighton subsequently proposed *nomina nova* for *A. silvestrii* of Wheeler without noticing that a prior *nomen novum* existed. The resulting synonymy is as follows:

APHAENOGASTER LEPIDA Wheeler

A. silvestrii Wheeler, Oct. 1929, Boll. Lab. Zool. Portici 24: 37–40, fig. 3, worker, male; *nec* Menozzi, Aug. 1929, Ibid., 22: 282.

A. (Attomyrma) lepida Wheeler, 1930, Proc. New Engl. Zool. Club 11: 96, *nom. pro A. silvestrii* Wheeler.

A. phillipi Menozzi, 1932, Boll. Lab. Zool. Portici 26: 311, nota, *nom. pro A. silvestrii* Wheeler. **New synonymy**

A. funkikoensis Creighton, 1950, Bull. Mus. Comp. Zool. 104: 152, nota, *nom. pro A. silvestrii* Wheeler. **New synonymy**

Cases of automatic synonymy in the family Formicidae are probably rather frequent, and their formal recognition will help to relieve the nomenclatorial confusion which exists in the absence of an up-to-date synonymic catalog.—W. L. BROWN, JR., Museum of Comparative Zoology, Harvard University, Cambridge 38, Mass.

BOOK REVIEW

HOW TO KNOW THE SPIDERS by B. J. and Elizabeth Kaston. Published by Wm. C. Brown Company, Dubuque, Iowa. 220 pages, 552 figures.

"How to Know the Spiders" is another excellent book of H. E. Jaques Pictured-Key Nature Series, similar in pattern to those already published on the insects, immature insects, beetles and others. Dr. Kaston and his artist wife have combined to present one of the finest books suitable for the naturalist or beginning students of spiders.

In the introductory pages the author gives an interesting account of the biology of spiders including notes on their food, courtship, habitats, webs and cocoons. There is a short section on the collection, preservation and rearing of spiders, and an excellent account on the structures used in classification. This last section is very well illustrated and is the most complete and easily understood account on spider classification seen by the reviewer.

The last part of the book consists of an illustrated key to 40 of the 49 families of spiders known in the United States to 190 of the common genera and 271 of the common species. Only those families which are quite rare are omitted in order to simplify the key. Included with each species recorded is an illustration and notes on its size, habitat, and distribution.

The species considered in the book are essentially Eastern with only a very few of those listed found in the West.—VINCENT D. ROTH.

OBSERVATIONS ON THE HABITS AND PREY OF EUCERCERIS RUFICEPS SCULLEN

(Hymenoptera, Sphecidae)

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The genus *Eucerceris* is confined to the western hemisphere and twenty-eight species are now recognized from America north of Mexico (Scullen, 1939, 1948, 1951). Until 1939, nothing had been published concerning the nesting habits or prey of any of these species. In that year Scullen (1939:12) published observations on the habits of *Eucerceris flavocincta* Cresson nesting in two sites at Breitenbush Hot Springs, Oregon, in July, 1934. The females were provisioning their nests with the weevil, *Dyslobus lecontei* Casey. Scullen also reported that Bridwell had observed the same species two years previously at Detroit, Oregon, preying upon *Dyslobus segnis* Le Conte. In the same publication (Scullen, 1939:40) records the capture in North Dakota of a female of *Eucerceris superba* Cresson carrying a specimen of *Ophryastes sulcirostris* (Say). The latter is an otiorhynchine weevil related to *Dyslobus*.

Eucerceris ruficeps Scullen (1948) was described from females collected at Antioch, California, and the observations reported here were made at the type locality in the fall of 1952.

The general area in which *Eucerceris* was encountered is the sand dune region just east of Antioch, along the south shore of the San Joaquin River. Although most of the area is covered by loose and shifting sand, occasional hard-packed areas occur throughout. In three such areas, the authors discovered six females of *E. ruficeps* which had appropriated abandoned burrows of the Halictine bee, *Lasioglossum (Sphecodogastra) aberrans* (Crawford)[2].

This bee nests throughout the area in late spring and early summer and its burrows are borrowed, later in the summer, by a number of other bees and wasps. Each burrow of the bee consists of a single vertical shaft which varies in depth from about thirty to forty-five centimeters.

The burrows of the *Eucerceris* exhibited the following features: About one centimeter within the entrance the female wasp constructs a thin plug across the burrow with a small passage through

[1] The writers wish to express their appreciation to G. A. Marsh for assistance in making some of the field observations reported here.

[2] Identified by P. D. Hurd, Jr.

one side of the plug. At this depth the diameter of the burrow is about six millimeters, the hole in the plug about three millimeters. The wasp also constructs a loose plug of moist sand at a depth of twenty to twenty-three centimeters and at the same point constructs a lateral tunnel away from the original bee burrow. The lateral unnel continues downward at angles of from thirty to sixty degrees with the vertical axis. The total length of the lateral tunnel varies considerably in different burrows but usually terminates at a depth of from 29 to 42 centimeters. Another plug of moist sand about four centimeters in length is constructed near the bottom of the lateral tunnel and the female wasps pack the weevils which they collect into this plug. Since the weevils in the plugs are always able to move, those in the cells immobile, it is presumed that the wasps either do not paralyze them until they are ready to place them in a cell or that the sting has a delayed effect upon the nervous system.

Females were never seen in the process of capturing weevils but some data are available on the plant relationships of the two weevils involved. Adults of the weevils, *Dysticheus rotundicollis* Van Dyke and *Sitona californicus* Fahrens, do not occur on the same species of plant. Both males and females of *Dysticheus* occurred near the nesting site on flowers of the composite, *Gutierrezia californica* T. & G. In another area they were found both on *Gutierrezia* and less commonly on another composite, *Senecio douglasii* D.C. *Sitona* were collected only from *Lotus scoparius* (Nutt.) Attley, although they may well occur also on other legumes growing in the locality. Both species of weevils were active in early August, when observations were made, but specimens of *Sitona* appeared to be less common than *Dysticheus*. In addition, the three *Eucerceris* burrows which were excavated contained a total of 106 *Dysticheus* and 82 *Sitona*.

The first burrow excavated contained a female wasp in fresh condition and four cells at depths of 28 to 31 centimeters. The contents of three of the cells had molded while the fourth cell contained a cocoon and living larva. One of the moldy cells contained only 6 *Dysticheus*, the other two, 15 each. The cell with the cocoon had fragments of 14 additional *Dysticheus*. The absence of cells containing freshly captured weevils raises some question as to just when the provisioning of the cells took place, although their association with the *Sphecodogastra* burrow establishes them as having been provisioned in the current year.

The second burrow was located when a female carrying a *Dysticheus* alighted about three feet from the first burrow which was being excavated at the time. This female was later captured, along with a second female, at a depth of about 20 centimeters in the lateral tunnel. Two moist sand plugs containing weevils were also encountered. The first at 29 centimeters contained two living *Sitona*, the second at 39 centimeters contained eight living *Distichеus*. Four cells associated with the burrow were also excavated. One cell at 30 centimeters had been provisioned with eleven *Dysticheus* which had been destroyed by Tachinids. Another at the same depth contained a living larva in its cocoon surrounded by the remnants of 15 *Dysticheus*. The third cell at 36 centimeters also contained a cocoon and fragments of 2 *Dysticheus* and 20 *Sitona*. At 38 centimeters the fourth cell with 1 *Dysticheus* and 12 *Sitona* had been destroyed by Tachinids. At a depth of 21 centimeters, where the lateral branch originated, 10 puparia were found in the earth to one side of the burrow. Since six of these were pale yellow-brown and four were larger and dark reddish-brown it seems apparent that more than one species of parasitic fly was attacking this host. Unfortunately neither of the female wasps could be associated individually with the weevils stored in the plugs or in the cells.

A third burrow was discovered about a foot away from the second while the second burrow was being excavated. The contents of four cells and part of the contents of a fifth cell were uncovered at depths of 36 to 42 centimeters. One cell with a *Eucerceris* cocoon had been provisioned with 15 *Dysticheus*. Adult wasps had emerged from the other four cells which had been provisioned as follows: (1) 18 *Sitona*, (2) 16 *Sitona*, (3) 3 *Dysticheus* and 11 *Sitona*, (4) 1 *Dysticheus* and 3 *Sitona* (incomplete cell).

Unfortunately the rarity of this species and the limited time at our disposal permitted only these few observations. However, the data suggest that the *Eucerceris* wasps search for their prey on a habitat basis and that variations in provisions are due to partially exhausting one of the available sources. Furthermore, although this species is known at Antioch from about a dozen females collected in August and September, the burrow evidence might be interpreted to indicate that the species is double-brooded.

Literature Cited

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1939. A review of the genus Eucerceris (Hymenoptera: Sphecidae). Oregon State Mon. Studies Ent., 1:7–80, figs.

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Book Review

THE ANTS OF CALIFORNIA, by Thomas W. Cook, Pacific Books, Palo Alto, Calif., XVI—462 pp., 92 figs. 1953. $10.00.

The reader is referred to the review of W. L. Brown and E. O. Wilson* for their reactions as ant specialists to this book.

In preparing this impressive, well printed book the author had a very sincere and generous purpose in mind. He wanted to provide something useful for the amateur who is often discouraged by the scattered and at times unavailable literature in a field. However, amateurs faced with this problem in studying the ants of California are at present almost non-existant and this book will do little to encourage the development of more. Indeed it may do much to discourage them. For one thing, the novice will be baffled at the outset by the lack of an adequate means of identifying ant subfamilies and genera. Cook offers three pages of line drawings of ant profiles to fill this need. Apparently the beginner is expected to compare the ant specimen in hand with the drawings and by trial and error arrive at a higher group identification. This is a fine idea but the beginner who needs such help is the one least likely to note the often slight critical differences (if any) apparent in these drawings.

Dr. Cook obviously has a great reverence for original descriptions and those he calls "revised descriptions" by subsequent workers. The great bulk of the book is due to the transcription and republication of these often useless combinations of words. It is most unfortunate to confront a beginner with such descriptions for many of them are of little value even to an expert. Dr. Cook's "naturalists of California," to whom he dedicates his book, would have been much better served by a standardized, modern redescription of each ant species together with adequate keys. This, however, would have resulted in a much smaller book.

Cook apparently assumed that the amateur is only interested in identification for little or no mention is made of such things as the technique of studying ants, making artificial nests, and conducting much-needed biological studies.

In short, the needs of California ant students are far from adequately satisfied by this book. One must commend the author, however, for his well meant purpose, the effort involved in transcribing the scattered work of others, and the personal expense in getting it published.—E. S. Ross.

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* Ent. News 64:163–164, 1953.

NEW SPECIES AND NOTES ON CALIFORNIA MAYFLIES. II

(Ephemeroptera)

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The present paper is given to describe several new species of mayflies reared from nymphs collected by the author and his wife, Helen L. Day, on streams of northern California, to record the collection of species not heretofore taken in California, and to note new synonyms in the Ephemeroptera.

Ephemerella levis Day, new species

(Figures 1, 2, and 3)

Male imago (in alcohol)

Length: Body 7.5 mm.; forewing 7.5 mm.; foreleg 6.25 mm.; tails 8 mm. *Head:* Pale yellow, widely washed with black; nasal carina and frontal margin white. Antenna pale smoky, basal segment brown and second segment pale. Ocelli milky white, ringed with black at base. A pair of narrow, black submedian stripes extend forward from posterior margin of head to median ocellus. Eyes large, orange, with lower portion black. *Thorax:* Pronotum pale yellow, extensively but lightly washed with black; a wide, black U-shaped mark, opening toward median line, parallels the margins on each side. Mesonotum pale yellow, median suture dark; a pair of short, dark dashes in antero-lateral corners; lateral areas of scutellum and entire metanotum, pale golden brown. A wide, V-shaped brown mark below base of forewing, anterior to coxa of middle leg. A prominent dark spot anterior to coxa of hind leg. Entire sternum golden brown, ganglionic areas marked with black on each of the thoracic segments. *Legs:* Yellowish white, foretibiae faintly smoky. Coxae, trochanters, and tarsal segments of middle and hind legs finely margined with hair-line of black; tibiae smoky at base. All tarsi with first segments faintly dark basally. *Wings:* Hyaline, stigmatic area of forewing milky white. Wingveins clear, colorless; a dark mark on subcosta near base. A wide, purplish black stripe lies between costa and subcosta, extending from humeral brace to base of wing. Axial cord of forewing dark purple. *Abdomen:* Segments 1–6 hyaline white, 7–10 opaque yellowish white. Tergites 3–7 with wide, dark bands on median portions of anterior margins; from terminals of these bands, a pair of short, wide, dark submedian bands direct themselves toward the median of posterior margin, but do not attain it. Central portions of tergites lightly surfaced with black. Tergites 1–9 marked with short, dark dashes or a pair of dark spots on each tergite on lateral margin just above pleural fold. Pleural fold pale. Ganglia darkened on sternites 1–7; dark stripes on lateral margins of sternites 1–9. *Genitalia:* Forceps and penes pale, smoky at tips. *Tails:* White, strongly banded with black at each joining.

Nymph (in alcohol)

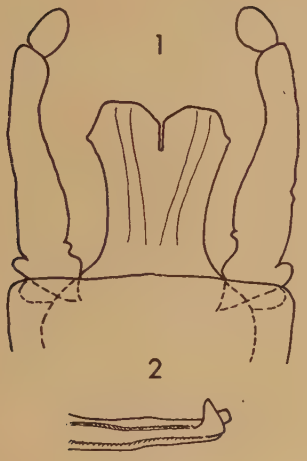
Length: Body of male 7.5 to 8.0 mm.; female 7.5 to 8.5 mm. *Head:* Smooth, pale yellow, irregularly mottled with dark brown. Maxillary palp

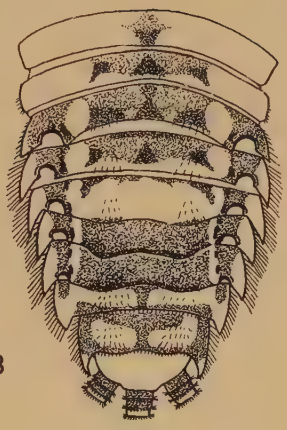
fairly well developed for nymph of *serrata* group. *Thorax:* Pale yellow, irregularly mottled with dark brown anterior to wing roots. Sternum variably pale yellow, pale brown, or mottled brown. Ganglionic areas usually marked with black. *Legs:* Pale yellow, strongly marked with brown. Anterior surfaces of coxae brown. Trochanters pale, with large brown spot on ventral surface of each. Femora pale, with wide, brown bands near ends, on anterior surfaces only. Tibiae pale, each with wide, brown band at middle and at basal joining. Tarsi brown, each with pale band near distal end. Claws brown, 4–7 denticles on each. *Abdomen:* Without paired dorsal spines. Posterior margins of tergites 5–7 slightly sinuate. Tergites gray brown with darkened lateral areas and dark anterior margins on 1–7. In male nymph, tergite 5 is often pale. Abdominal segments 3–9 with well developed, flattened lateral extensions, each of which bears a postero-lateral spine; when viewed from above, the lateral spines of tergite 8 appear very short; the spines of tergite 3 are small but well formed. Sternites pale with ganglionic areas darkened; a single row of curved, brown marks along lateral margins. On well marked specimens, a row of four dark spots in a line paralleling and close to anterior margin of each sternite. *Gills:* Borne on segments 3–7. *Tails:* Alternately white and brown, each joining narrowly dark; a whorl of spines at each joining.

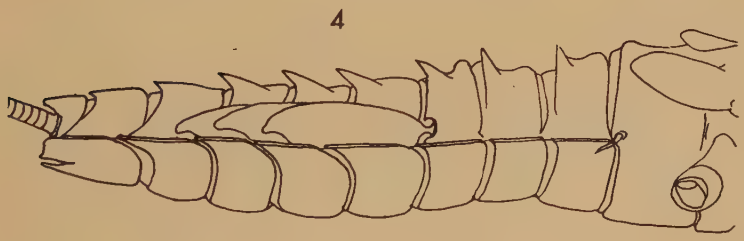
Holotype: Male imago; reared from nymph collected by the author on Capell Creek, Napa County, California, June 14, 1952; in collection of the California Academy of Sciences. *Paratypes* (all topotypical) : 1 ♂ in Canadian National Collection; 1 ♂ in collection of Cornell University; 1 ♂ in collection of G. F. Edmunds, Jr.; 3 ♂ in author's collection. *Nymphs:* 35 nymphs collected on Capell Creek on June 14, 1952, 40 collected on Capell Creek on May 20, 1950, and 25 collected on Sulphur Creek, Sonoma County on July 15, 1950. Nymphs have been sent with the male imagos listed above.

Ephemerella levis Day belongs to the *serrata* group of *Ephemerella,* and the male adult is identical in general appearance, maculation, and structure of the genitalia with *E. micheneri* Traver; however, the foretibia of *E. levis* is 50% longer than the forefemur, while that of *E. micheneri* is twice as long, these proportions being constant in all specimens examined. When describing the adults of *E. micheneri* in 1934, Dr. Traver tentatively associated the nymphs of this species with imagos taken at the same time and place; the writer has reared adults of *E. micheneri* from nymphs, and can confirm Traver's association of nymph and adult as being correct.

The nymph of *E. micheneri* has distinct and well formed submedian, paired dorsal spines on tergites 2–8, and postero-lateral spines on segments 4–9. The nymph of *E. levis* has no dorsal







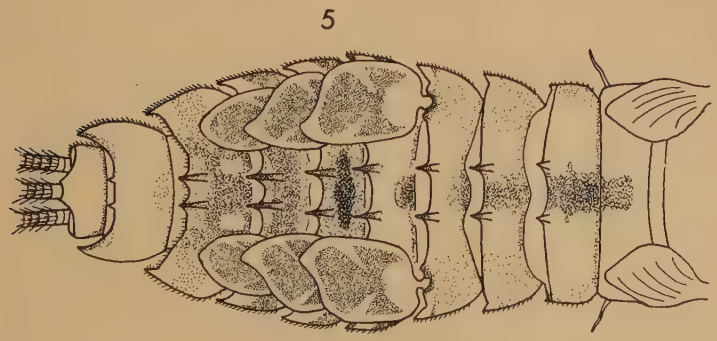


PLATE I

Fig. 1. *Ephemerella levis*, genitalia, ventral aspect; Fig. 2. *Ephemerella levis*, penes, lateral aspect; Fig. 3. *Ephemerella levis*, tergites of nymph; Fig. 4. *Ephemerella soquele*, abdomen of nymph, lateral aspect; Fig. 5. *Ephemerella soquele*, tergites of nymph.

spines, and bears postero-lateral spines on segments 3–9. In both species, the postero-lateral spines of segment 8 seem lacking when viewed from above. The lateral spines of *E. micheneri* nymphs are edged with strong, short spines; those of *E. levis* are softer, longer, and hair-like.

E. levis nymph is the exclusive western member of the *serrata* group lacking dorsal abdominal spines. On Capell Creek, the nymphs of both *E. micheneri* and *E. levis* are plentiful, and are found in shallow, slowly running water, resting on sandy bottoms; in this stream, the nymphs of *E. micheneri* mature about two weeks prior to those of *E. levis*. On Sulphur Creek, nymphs of *E. levis* were numerous, but *E. micheneri* could not be found.

The association of nymph and adult was established through rearing.

Ephemerella soquele Day, new species

(Figures 4 and 5)

Nymph (in alcohol)

Length: Body 7.5 to 8 mm.; tails 3.5 mm. *Head:* Vertex pale with a pair of wide submedian pale brown stripes from ocelli to posterior margin; fronto-clypeus dark brown. Lateral margins of labrum black. Antero-lateral portion deeply cut away, exposing mandibles almost to base. *Thorax:* Pronotum pale, with a few brown spots; anterior and lateral margins straight and posterior margin slightly emarginate; a pair of low, blunt tubercles near median line, one on each side. Mesonotum pale, the developing scutum of the adult outlined in black; a pair of wide, dark submedian curved stripes extend the full length of the segment. *Legs:* Trochanters and coxae dark; femora pale, basally dark-marked and smoky. Tibiae pale, dark banded near apical ends, and femoro-tibial knees dark. Tarsi dark brown, narrowly pale basally. Claws pale smoky brown. *Abdomen:* Prominent lateral extensions on segments 3–9, each with postero-lateral spine; abdomen widest at segments 5 and 6; the postero-lateral spines of segment 3 are small, but well formed and distinct. Fine, sharp-pointed submedian abdominal spines are borne on tergites 2–9, being longest on tergites 6 and 7; these spines are elevated from the dorsal plane of tergites 2–4 about 60 degrees, but progressively decrease this angle to about 10 degrees on tergite 9. Tergites 1–5 pale, with lateral areas widely dark brown; tergites 1–5 with median brown areas. Tergites 6 and 7 solid dark brown, with a pair of small pale areas on anterior margins, one on each side. Tergite 8 with median area pale, dark brown on each side. Tergites 9 and 10 wholly pale. Lateral extensions dark brown, postero-lateral spines pale. Sternites dark brown, 8 and 9 sometimes pale with a few dark markings. Sternites with short hyaline-white submedian dashes based on anterior margins of 2–9; a single row of short dark dashes usually along lateral border at bases of lateral extensions. *Gills:* Borne on segments 4–7, those on 4–6 being semi-operculate; rudimentary gill on segment 1. *Tails:* Fringed with hairs on each side, hairs longest at middle, nearly bare at tips. Tails pale, tips dark.

Holotype: Male nymph; collected by Helen L. Day and the author at Soquel Meadow, Willow Creek, Madera County, California, on July 14, 1951; in the collection of the California Academy of Sciences. *Paratypes:* 4 nymphs in California Academy of Sciences collection; 4 nymphs in Canadian National collection; 4 nymphs in Cornell University collection; 4 nymphs in G. F. Edmunds, Jr. collection. 20 nymphs in author's collection.

Ephemerella soquele Day belongs to the *simplex* group of this genus, and is most closely related to *E. margarita* Needham. In *E. margarita*, the paired dorsal abdominal spines are very short and are borne on segments 3–9; in *E. soquele*, these paired spines are borne on tergites 2–9, and are much larger and longer, those on 6 and 7 being more than one-fourth as long as the tergites on which they are located. The postero-lateral spines on *E. margarita* are found on segments 4–9; in *E. soquele* these spines are longer, more acute, and found on segments 3–9. The middle and hind legs of *E. margarita* are comparatively shorter than those of *E. soquele*. The outer margins of the mandibles of *E. margarita* are almost straight, while those of *E. soquele* are widely convex.

On Willow Creek, the nymphs of *E. soquele* were taken on a shallow, sandy bottom at the quiet, warm edge of a large pool.

Rhithrogena decora Day, new species

(Figures 6, 7 and 8)

Male imago (in alcohol)

Length: Body 7.0 mm.; forewing 7.84 mm.; foreleg 5.6 mm.; tails 16.8 mm. *Head:* Pale yellow brown, nasal carina darker; frontal margin widely hyaline, speckled with fine, black spots, these spots larger and closer together in median portion. Ocelli black, centers milky. First joint of antenna short, pale, with white surrounding base; second joint longer, pale with dark tip, flagellum smoky with dark tip. Eyes contiguous, pale yellow brown, lower portions black. *Thorax:* Pronotum pale yellow, a short, wide, purple black stripe on medial portion of posterior margin. Mesonotum pale yellow, postero-lateral areas washed with pale brown; inner parapsidal and median furrows marked finely with black; scutellum and postscutellum dark brown; the median dorsal surface of scutellum and median area of scutum immediately anterior, chalky white. Scutellum of metanotum pale with four dark spots; postscutellum dark brown. Pleura pale yellow and chalky white, prominently marked with three wide purple black stripes, as follows: from the anterior point of attachment of wing base, a wide stripe extends forward to pronotum; from the same point of origin, a second wide stripe extends obliquely downward and across foreleg above forecoxa; posterior to and paralleling this latter stripe, another stripe extends from wing base down under the foreleg, terminating on the prosternum. A short, wide purple black stripe above each coxa. *Legs:* White, foreleg with femur yellowish, tibia and tarsi faintly

darker. Coxae each with black spot on apical margin. Femora finely margined with black at basal joining, and dark banded at distal end; strongly marked with short, black, longitudinal stripe at middle of anterior surfaces. Tarsal joinings finely black. Claws somewhat darkened. *Wings:* Clear and iridescent; longitudinal veins light gray, crossveins colorless; humeral brace blackish brown except for short portion near and at costa. Stigmatic area of the forewing, milky white. Of the 15–18 crossveins of the stigmatic area, three or four are usually forked or anastomosed, while numerous specimens have these crossveins simple and unforked. *Abdomen:* Tergite 1 purplish brown, anterior margin white; 9 and 10 chalky white. Tergites 2–8 washed with purplish brown, posterior margins darker, marked with hyaline white pattern as follows: large triangles in the four corners; paramedian spots one-quarter distant from posterior margin; wide, curved stripes based on anterior margin almost reaching paramedian spots; a narrow median stripe. Sternites 7–9 largely chalky white; 1–6 hyaline white. *Genitalia:* Forceps and penes smoky. *Tails:* Smoky, lighter at tips; a few sections at base faintly dark ringed at joinings.

Female imago, (in alcohol)

Female slightly larger and much paler than male, the abdomen being a light, rosy purple.

Nymph, (in alcohol)

Length: Body of male 6.0 mm.; female 7.0 mm. *Head:* Concolorous blackish brown, posterior margin paler; epicranial sutures hyaline white. *Thorax:* Notal surfaces, including wingpads, blackish brown, with a solid white band across posterior half of mesonotum and bases of wingpads; near anterior border of this white band, a pair of small, circular dark spots near lateral margins, one on each side; a narrow white median stripe extends the full length of both segments. *Legs:* Femora medium brown, anterior surfaces with large white area on basal half, and smaller white area at distal end; in middle of basal white area, a large black spot and 4–5 tiny spots; dorsal edge with numerous spines. Tibiae smoky. Tarsi pale, distally dark banded. Claws smoky. *Abdomen:* Tergites 1–4 medium brown, 6–10 blackish brown. Tergite 5 white, lateral margins widely dark brown; posterior third of tergite 4 and anterior third of tergite 6 sometimes white. Small paramedian dark spots usually found on tergites 3 and 4. Spiracles marked with large dark spots. Posterior margins of tergites 1–10 set with numerous fine denticles. Sternites brown, very pale on sternite 1, progressively darker to sternite 9 which is very dark; lateral margins blackish brown; a short, black stripe in median portion, parallel and close to each posterior margin; half-way between lateral margins and median line, and parallel to latter, a long, narrow white stripe; oblique white dashes are based on anterior margins near median line; paramedian white spots usually on stenite 8. *Gills:* Lamellae translucent white, tracheae smoky; fibrillae smoky. Lamellate gills 1–6 "eared", the "ear" of gill 1 being very small, and those of 3–5 proportionately very large. *Tails:* White.

Holotype: Male imago, collected by author and Helen L. Day on Hat Creek, Shasta County, California, July 21, 1953; in collection of California Academy of Sciences. *Allotype:* Female

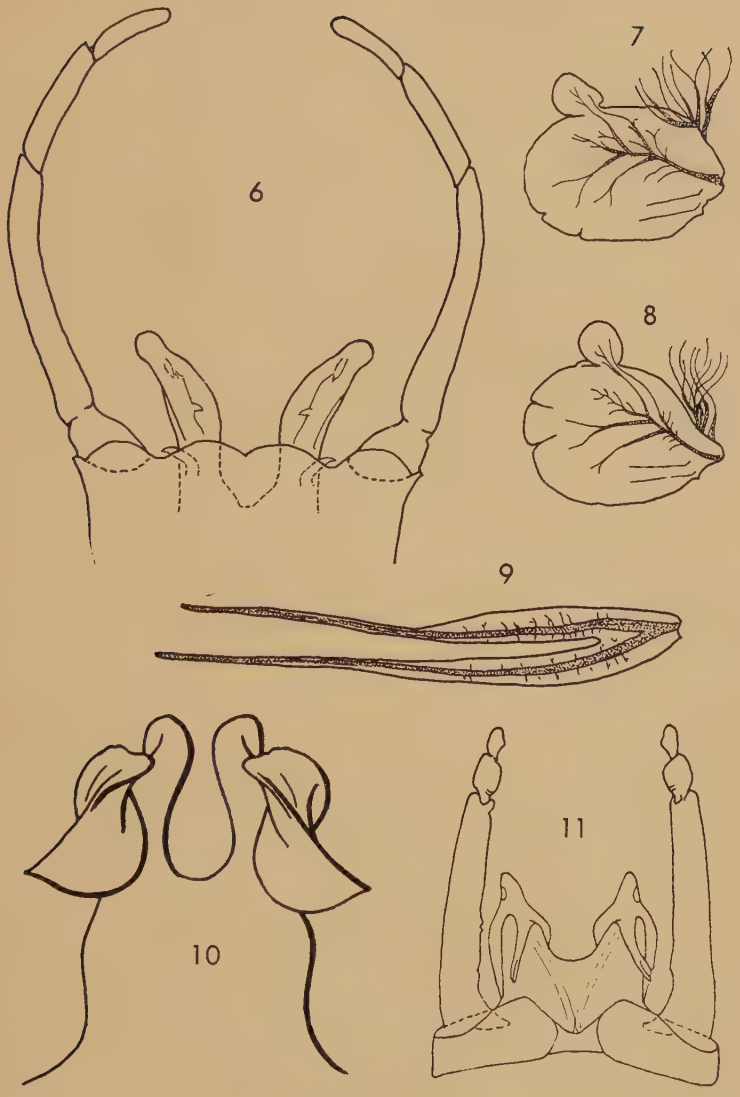


PLATE II

Fig. 6. *Rhithrogena decora*, genitalia, ventral aspect; Fig. 7. *Rhithrogena decora*, third nymphal gill; Fig. 8. *Rhithrogena decora*, fifth nymphal gill; Fig. 9. *Paraleptophlebia cachea*, third nymphal gill; Fig. 10. *Paraleptophlebia gregalis*, penes, ventral aspect; Fig. 11. *Paraleptophlebia cachea*, genitalia, ventral aspect.

imago, same data. *Paratypes* (all topotypical): 3 ♂ in Canadian National Collection; 3 ♂ in Cornell University Collection; 3 ♂ to G. F. Edmunds, Jr.; 65 ♂ in author's collection. *Nymphs:* 50 nymphs collected between Emigrant Crossing and Boundary Camp on Hat Creek, July 15 to July 30, 1953. Nymphs have been sent with the male imagos listed above. The association of nymph and adult was established through rearing.

Diagnosis: Rhithrogena decora Day is of the *brunnae* type, and is much smaller than any *Rhithrogena* found in California to date. The nymph is recognized by the wide white banding of the thorax which contrasts strongly with the small dark body. This species seems quite tolerant of temperature differences, nymphs being well developed in various sections of Hat Creek that varied from 50° to 62° F. measured at 3:00 P. M. Nymphal emergence occurs from 5:00 to 6:30 P. M., and the adults are attracted to light.

R. decora occurs in close association with what I now refer to as *Rhithrogena californica*, n. sp., a medium brown species very closely related to *R. doddsi*. During the last week in July, 1953, the last of the *R. decora* were emerging at the same time as the first of the *R. californica* were emerging.

Compared to other California *Rhithrogena*, *R. decora* seems most stable in the form and spining of the penes. In all specimens examined, the arms of the penes are narrowed and rounded at the tips, and slightly divergent; one strong mid-ventral tooth is found on each arm, and the apical spines, which can be seen only at high magnifications, are little more than fine, scattered hairs.

Paraleptophlebia cachea Day, new species

(Figures 9, and 11)

Male imago (in alcohol)

Length: Body 9.0 mm.; forewing 9.0 mm.; foreleg 9.0 mm.; tails 13.0 mm. *Head:* Fuscous, frontal margin widely translucent pale brown; a wide, pale brown median stripe on vertex. Eyes almost contiguous, pale with lower portion black. Ocelli milky white, bases black. First two segments of antenna brown, flagellum dark smoky, tips white. *Thorax:* Pronotum brown, median portion of anterior and posterior margins and median line with black stripes. Mesonotum fuscous, lateral and anterior margins yellow marked with fuscous; margins and area anterior to scutellum black. Sclerites of pleuron dark brown, membranous areas yellow. Metanotum dark brown with black markings. *Legs:* Femora medium golden brown, forefemur darkened at distal end. Tibiae light brown; tarsi pale. *Wings:* Faintly milky, stigmatic area light brown tinted and translucent. Wing veins yellow brown, progressively paler toward posterior margin. *Abdomen:* Tergite 1 dark brown; 7–10

medium golden brown; 2–6 yellow brown. Anterior margins of tergites and geminate stripes along pleural fold smoky; a fine black mark from spiracles to postero-lateral corners. Tergites 2–10 with median dark stripe and short oblique dark dashes from a point near median of anterior margin. Sternites 1 and 8 medium brown with small, dark paramedian spots. Sternite 9 with dark brown W-shaped mark based on anterior margin, occupying about one-half the area of this sternite; remainder of sternite 9 white. Sternites 2–7 pale yellow brown, anterior margins usually dark; small paramedian dark spots present, as well as very short dark oblique dashes based close to anterior margins. Ganglionic areas of sternites 2–7 usually very faintly brown tinted. *Genitalia:* Forceps base, forceps and penes light, bright brown. *Tails:* Yellow brown, paling distally; joinings narrowly marked with red brown.

Female imago (in alcohol)

Female imago larger and lacking strong color contrasts of male imago. Head and mesonotum medium dark brown; abdomen more reddish and concolorous than male imago. Abdominal markings as in male; wing veins heavier and stronger in color than male, being dark red brown.

Nymph (in alcohol)

Length: Body of male 8.0 mm.; female 9.0 mm. *Head:* Dark red brown, white areas laterad and cephalad of ocelli. Antenna pale at base, darkening distally, 5 mm. in length. *Thorax:* Notum dark red brown, anterior margins of pronotum and mesonotum black. Developing scutellum of mesothorax black. *Legs:* Coxae and tronchanters dark brown. Femora and tibiae pale brown. Tarsi dark brown. Claws dark at base, white tipped, with 18–21 fine denticles on inner margin of each. Ventral margins of all segments closely set with fine spines, those of dorsal margins being coarser and less numerous; a ring of strong spines near apical margins of tibiae. *Abdomen:* Dark red brown, unmarked; overlapping of tergites gives appearance of wide black posterior margins of these. Sternites pale yellow brown, very widely dark brown laterally; anterior margins narrowly black; dark spots and oblique dashes of adult can be faintly seen. Sharp postero-lateral spines borne on segments 8 and 9; short, blunt spines on segment 7. In the nymphal cast skin, adult pattern of the tergites can be seen clearly. *Gills:* Broadly lanceolate, divided almost to base. Tracheae strongly dark, as are a few tracheoles. *Tails:* Light brown, pale lateral hairs stemming from joinings.

Holotype: Male imago, reared from nymph collected by the author and Helen L. Day on small tributary of Cache Creek, Yolo County, California, 6 miles north of Rumsey, April 19, 1953; in collection of California Academy of Sciences. *Allotype:* Female imago, same data. *Paratypes* (all topotypical): 1 ♂ in Canadian National Collection; 1 ♂ in Cornell University Collection; 1 ♂ to G. F. Edmunds, Jr.; 8 ♂ of April 19, 1953, 6 ♂ and 3 ♀ of April 26, 1953, and 4 ♂ of May 17, 1952 in author's collection. *Nymphs:* Nymphs and cast skins have been sent with types and paratypes listed above; the author retains 8 nymphs and

12 cast skins. The association of nymph and adult was established through rearing.

Diagnosis: The form of the penes of *P. cachea* Day shows no least variation among the male adults collected in two different years, and serves to separate this species from *P. californica* and *P. quisquilia*. From the latter two species, *P. cachea* may also be separated by the markings of the abdomen, and by the blackness of the dorsum of both male adult and nymph of the new species.

The nymphs of *P. cachea* are adapted to unusually high water temperatures as we found them actively moving about in a small, slow moving creek of 72° to 76° F. at 3:00 P. M. All other nymphs of *Paraleptophlebia* observed by the author emerge at water temperatures of 48° to 60° F.

Ameletus validus McDunnough

(Figures 12 and 14)

Ameletus validus McDunnough, 1923. Canad. Ent. 55:50

Through the kindness of Mr. W. J. Brown of the Canadian National Collection, I have examined the paratype of the above species, and a slide of the genitalia of same, taken at Banff, Alberta, on September 30, 1922 by C. B. D. Garrett, and can now state that the same late season species is also found in California. From September 26 to September 30, 1953, the author and his wife took nymphs for rearing from the Upper Truckee River, El Dorado County, California, which proved to be *A. validus*.

In this stream, with water at 52° F. at 3:00 P. M., the nymph emerges for about two hours starting at 10:30 A. M. The nymph is found only where well protected from the slightest current at the water's edge, between and behind small stones. In emerging, the nymph crawls entirely out of the water, breaks out of the skin, dries the wings for up to 21 minutes, and flies high into nearby trees. The only other mature nymph found in association with *A. validus* was *Paraleptophlebia debilis*.

As an aid to identification, a drawing of the genitalia of *A. validus* is given as a part of this paper.

Rhithrogena flavianula McDunnough

(Figure 13)

Heptagenia flavianula McDunnough, 1924. Canad. Ent. 56:225

By comparison with a paratype and genitalia slide of the above species, loaned by the Canadian National Collection, verification has been made of the collection of *R. flavianula* on the West Fork

of the Carson River, Alpine County, California. The drawing of the penes given at the time of description of *R. flavianula* lacks several details, so a new drawing is presented herewith.

As is true of other species of the genus Rhithrogena, the uprightness or divergence of the arms of the penes cannot be depended upon as a character for the separation of species, as in several species of Rhithrogena there is great variation shown in this degree of divergence. In several species of Rhithrogena there is also found considerable variation in the size and numbers of teeth and/or spines on the penes of the male adult.

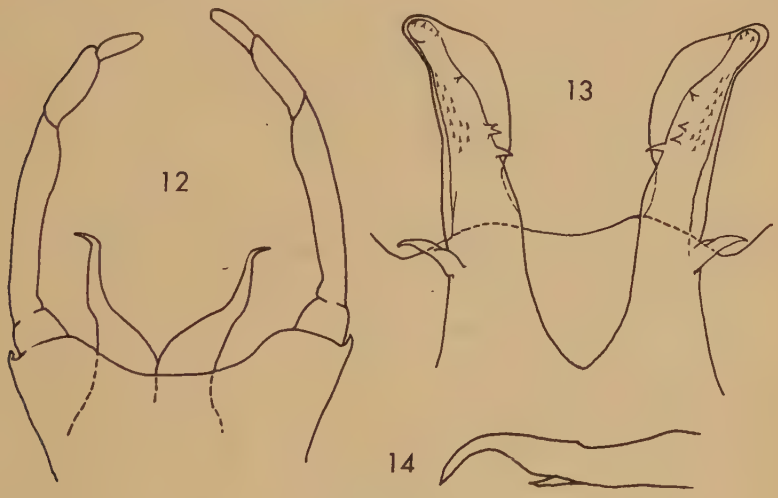


PLATE III

Fig. 12. *Ameletus validus*, genitalia, ventral aspect; Fig. 13. *Rhithrogena flavianula*, penes, dorsal aspect; Fig. 14. *Ameletus validus*, penes, lateral aspect.

Ephemerella hystrix Traver

Ephemerella hystrix Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:212
Ephemerella spinosa Mayo, 1951. Pan-Pac. Ento. 27:122

Examination of the holotypes of *E. hystrix* and *E. spinosa*, together with many specimens of *E. hystrix* collected by the author in five counties of California, leads to the conclusion that *E. spinosa* is a synonym of *E. hystrix*. A micro-slide of mouthparts of *E. hystrix* from Cornell University Collection bears the same collecting data as the holotype, and shows these mouthparts to be identical with those of the California species.

The holotype nymph is faded, but the small denticles on the abdominal spines are easily seen and precisely like those of the California specimens in size and placement. Even though faded, the Cornell holotype shows the distinctive maculation of tergites and sternites, and the dark pattern of the gills just as they are seen in all California specimens. The holotype is broader proportionately than some California specimens, and less broad than others.

Like all other species of long-spined *Ephemerella* collected by the author, I find considerable variation in the length, curvature and inclination of the dorsal spines of the California *E. hystrix*, and the holotype nymph falls well within the limits of these variations.

Ephemerella proserpina Traver

Ephemerella proserpina Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:223
Ephemerella yosemite Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:225

E. proserpina was described from a single nymph taken in the San Bernardino Mts. of California, and *E. yosemite* from ten quite immature nymphs from Central and Northern California. I have examined the above specimens and collected many mature and immature nymphs of this species from seven California Counties; recently, a mature specimen of the species, collected in the San Bernardino Mts., was received from John Belkin. I feel certain that but one species is involved in all the above material, and that *E. yosemite* is a synonym of *E. proserpina*.

The variation in this species is typical of the nymphs of the long-spined *Ephemerella*, and can be demonstrated in the following analysis of a few characters in twenty-four mature nymphs of *E. proserpina* taken from one area of about sixty square feet on East Fork Carson River on July 3, 1949.

AA 19 have posterior pair pronotal tubercles of equal height
of these
13 with low submarginal pronotal tubercles
6 with higher submarginal pronotal tubercles
12 with margin of 9th. segment flared
7 with margin of 9th. segment straight

BB 5 have posterior pair pronotal tubercles unequal in height
of these
2 with low submarginal pronotal tubercles
3 with higher submarginal pronotal tubercles
5 with margin of 9th segment straight

Male and female adults of *E. proserpina* have been reared and will be described in another paper.

Paraleptophlebia gregalis Eaton

(Figure 10)

Leptophlebia gregalis Eaton, 1884. Trans. Linn. Soc. London, Sec. Ser. Zool. 2:98

Leptophlebia invalida McDunnough, 1926. Canad. Ent. 58:297

In connection with correspondence concerning *P. gregalis,* Mr. D. E. Kimmins of the British Museum (Natural History) has recently cleared in KOH "the genitalia of a paratype which appeared identical with the type in the dried state," and has supplied me with a fine drawing, which is reproduced herewith. Mr. Kimmins' drawing gives, for the first time, the true appearance of this taxonomic feature that is essential to the correct separation of *P. gregalis.*

Comparison of a Canadian National Collection micro-slide of the genitalia of a paratype of *P. invalida* with the above drawing from Mr. Kimmins, would seem to establish the fact that *P. invalida* is a synonym of *P. gregalis;* the possibility of this synonymy was first suggested by McDunnough in his original description of *P. invalida.*

P. sculleni may also prove to be a synonym of *P. gregalis. P. sculleni* was described from a now broken-up single male adult, this specimen having had forelegs missing when described. The slide of the genitalia made from the holotype of *P. sculleni* is in excellent condition, and shows marked similarities to *P. gregalis,* notably in the apical lobes of the penes, opening between same, and the unique, widely curved lower margins of the reflex spurs shown in the sketch from Mr. Kimmins. The type locality of *P. gregalis* was given as "Mt. Hood" and that of *P. sculleni* as "Corvallis, Oregon"; these localities are about 100 miles apart.

Siphlonurus spectabilis Traver

Siphlonurus spectabilis Traver, 1934. J. Elisha Mitchell Sci. Soc. 50:233

Siphlonurus maria Mayo, 1939. Pan-Pac. Ento. 15:145

The author has examined the type material of *S. spectabilis* and that of *S. maria,* has re-collected and reared adults at the type localities of both species, and collected specimens of this very common species in 14 California counties. I feel sure that but one species of the two is valid, and that *S. maria* is a synonym of *S. spectabilis.*

The original description of the male adult of *S. spectabilis* was drawn from the single male adult collected, and it seems probable to me that this was a teneral or improperly preserved specimen;

the Mayo description of *S. maria* perfectly describes the specimens that I collected on Waddell Creek, the type locality of *S. spectabilis*.

In connection with several points made in the diagnosis of *S. maria* accompanying the species description (P.P.E. 15:148), *S. spectabilis* from Waddell Creek and elsewhere is usually dark red brown in life, forewings are speckled as in specimens from Amador County, and hindwings nearly or wholly dark orange brown. The Waddell male adult has the oblique band across the eyes, and I can find no differences in size of spines of the penes nor length of the forceps except in proportion to the size of the specimen, which is variable. Both the color of the abdomen and hind wing of the male adult varies from one location to another, and in specimens collected at different times from one location; there is some reason to believe that the later hatch is smaller and paler, as in several species of the genus Callibaetis.

New Records of Mayflies in California

The author and his wife, Helen L. Day, have collected in California several known species not previously reported from this State, as follows:

Species	Area of type locality	Collected in California
Heptagenia elegantula Eaton	Colorado	Stanislaus County
Rhithrogena doddsi McDunnough	Alberta	Montane
Rhithrogena morrisoni Banks	Nevada	General
Cinygmula uniformis McDunnough	B. C.	Coast Range
Iron (Epeorus) albertae McDunnough	Alberta	General
Iron (Epeorus) dulciana McDunnough	B. C.	Sierra Nevada
Iron (Epeorus) longimanus Eaton	Colorado	General
Siphlonurus occidentalis Eaton	Colo. - Wash.	No. Calif.
Paraleptophlebia debilis Walker	N. S.	General
Ephemerella heterocaudata McDunnough	Wyo. - Mont.	Montane
Ephemerella coloradensis Dodds	Colorado	Montane
Baetis insignificans McDunnough	B. C.	Siskiyou County
Baetis intermedius Dodds	Colorado	Sierra Nevada
Baetis tricaudatus Dodds	Colorado	Sierra Nevada
Centroptilum convexum Ide	Ontario	No. Calif. Coastal

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1924. New North American Ephemeridae. Canad. Ent. 56(9):221–226, pl. 5.

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NEW SPECIES OF CALIFORNIA MAYFLIES IN THE GENUS BAETIS

(Ephemeroptera)

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Living under conditions of great variety, representatives of the genus Baetis are found in many types of moving fresh water in California. The small nymphs have adapted themselves to a wide range of temperatures and climates, and are taken at all elevations and at many seasons.

The adult swarms ordinarily consist of a large number of individuals, and flights often occur in bright daylight. Heavily preyed upon by birds and insects, the large populations of Baetis are probably a most important element in their survival.

In the present paper, four new Baetis are described, these possibly having speciated in the Coastal Valleys of this State.

Baetis leechi Day, new species

(Figures 1 and 2)

Male imago (in alcohol)

Length: Body 4.0 mm.; forewing 4.0 mm.; foreleg 4.0 mm.; tails 9.0 mm. *Head:* Pale yellow brown, posterior margin finely black; a broad median Y-shaped black stripe running cephalad from posterior margin, forks into a pair of submedian fine stripes which terminate at lateral ocelli. Basal segment of antenna brown, second segment and filament yellow. Eyes .6 mm. on longest diameter; stalks .4 mm. in height, measured up the outer side. *Thorax:* Pronotum yellow washed with black. Mesonotum bright red brown, median suture and margins of scutum finely black. Scutellum pale, a pair of very small submedian pale spots anterior to this pale area; heavily margined with black. Sternum with brown sclerites outlined in black. *Legs:* Coxae brown; foreleg smoky with femur darker; middle and hindlegs pale. *Wings:* Hyaline, stigmatic area strongly milky and with 3–5 crossveins

strongly slanting; a small dark spot at base of each wing. Wingveins entirely colorless. Paired marginal intercalaries of forewing longest toward costal margin but lacking in first interspace. Hindwing with three longitudinal veins, the third close to and joining hind margin about half-way to tip; no crossveins or intercalaries; costal projection prominent and strongly curved much as in Centroptilum. *Abdomen:* Tergite 1 red brown, 7–10 opaque yellow with faint cast of brown; 2–6 hyaline palest yellow brown with wide white hyaline posterior margins; wide whitish median and paramedian stripes full length of tergites 2–6. Sternites 1–7 hyaline palest yellow. The wide black geminate lines along pleural fold enclose a strong black spiracular spot and another dark spot near anterior margin on each segment 1–7. *Genitalia:* Second joint of forceps tapered as in the *intercaleris* group. All segments of forceps translucent milky white; a fine black lateral line at base of first segment of forceps. *Tails:* Translucent milky white; joinings white.

Holotype: Male imago, collected by Helen L. Day and the author on CONN CREEK, near RUTHERFORD, NAPA COUNTY, CALIFORNIA, September 24, 1949, in California Academy of Sciences collection. *Paratypes,* all topotypical: 5 ♂ in Canadian National collection; 5 ♂ in Cornell University collection; 5 ♂ to G. F. Edmunds, Jr.; 40 ♂ in author's collection.

Diagnosis: B. leechi Day is the first Baetis with hindwing of the *quilleri* type reported from California. *B. leechi* is quite close to *B. erebus* Traver but, apart from color differences, *B. leechi* is smaller and lacks crossveins and intercalaries in the hindwing.

In describing this new species, I take pleasure in naming it in honor of Hugh B. Leech of the California Academy of Sciences.

Baetis diablus Day, new species

(Figures 3 and 4)

Male imago (in alcohol)

Length: Body 9.0 mm.; forewing 8.0 mm.; foreleg 6.5 mm.; tails 17.0 mm. *Head:* Dark red brown. Antenna dark red brown, white tipped. Eyes rather large, moderately elevated; .9 mm. in greatest diameter, stalk .4 mm. in height, measured up the outer side. *Thorax:* Pronotum fuscous with a few pale markings. Mesonotum fuscous; small postero-lateral areas, area anterior to scutellum and outer parapsidal furrows pale. Scutellum outlined in black. Sternum fuscous. *Legs:* Coxae dark brown edged with black. Foreleg yellow brown. Middle and hindlegs whitish. *Wings:* Clear hyaline, stigmatic area of forewing milky. Crossveins of stigmatic area and longitudinal veins of forewing pale gray, except those of anal area which are colorless. Crossveins of stigmatic area irregular, some forking, with short horizontal veins between. Marginal intercalaries short, a pair of shorter ones in the first interspace. Hindwing with three long veins, the second vein forking from a point about three-fifths distant from the base; usually with one intercalary between first and second vein, and two intercalaries within the fork of the second vein. Third vein straight, rather long. Costal projection of the hind wing acute. *Abdomen:* Segments 1 and 7–10 dark brown; 2–6 hyaline yellow brown,

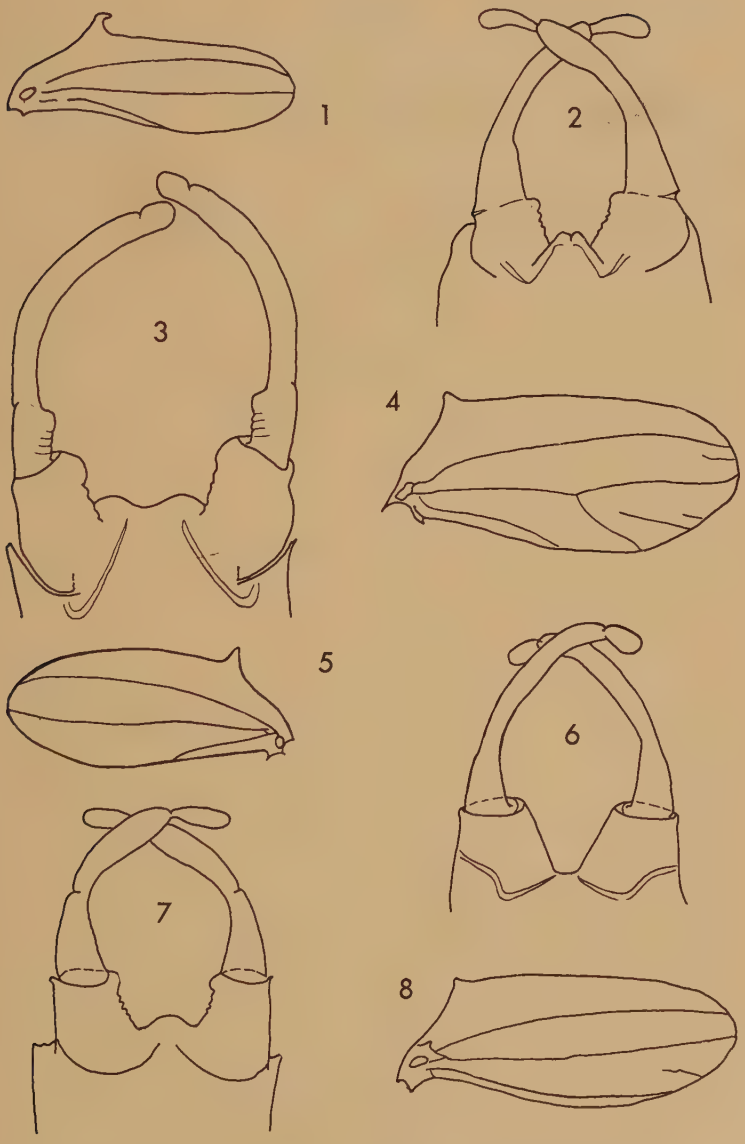

Fig. 1 *Baetis leechi,* hindwing; Fig. 2 *Baetis leechi,* genitalia; Fig. 3 *Baetis diablus,* genitalia; Fig. 4 *Baetis diablus,* hindwing; Fig. 5 *Baetis alius,* hindwing; Fig. 6 *Baetis alius,* genitalia; Fig. 7 *Baetis sulfurosus,* genitalia; Fig. 8 *Baetis sulfurosus,* hindwing.

tergites darker. Tergites with wide dark paramedian stripes, one on each side. Sternites each with a pair of short oblique dark dashes from middle of anterior margin. Anterior margins of segments finely dark; posterior margins white. *Genitalia:* Distinctly of the *moffati* type, first and second segments dark brown, third and fourth smoky brown; third and fourth segments almost completely fused, their joining marked with a short black line on the outer side. *Tails:* Yellow brown, a few basal segments very dark and tips white. All joinings hyaline white edged with smoky.

Holotype: Male imago, collected by E. I. Schlinger on Mt. Diablo, Contra Costa County, California, April 12, 1952, in California Academy of Sciences collection. *Paratypes*, all topotypical; 1 ♂ in Canadian National collection; 1 ♂ in Cornell University collection; 1 ♂ to G. F. Edmunds, Jr.; 2 ♂, slides of genitalia and wings in author's collection.

Diagnosis: Baetis diablus Day is, to date, the exclusive species of the genus having a forked second hindwing vein combined with genitalia of the *moffati* type. The fork of the second hindwing vein is unlike that of *B. parvus* or *B. devinctus*, as it branches much closer to the distal margin of the hindwing. The fork of the vein in *B. diablus* is comparatively shallow and obtuse.

Baetis alius Day, new species

(Figures 5 and 6)

Male imago (in alcohol)

Length: Body 6.0 mm.; forewing 5.5 mm.; foreleg 5.0 mm.; tails 12.0 mm. *Head:* Dark brown. Antenna brown with white tip, base ringed with white. Eyes .75 mm. on longest diameter; stalks .5 mm. in height measured up the outer side. *Thorax:* Pronotum blackish brown, paler in median area. Mesonotum red brown, scutellum paler; median suture, outer parapsidal furrows, posterior third of inner parapsidal furrows and margins of scutum finely black. Metanotum margined with black. *Legs:* Coxae brown. Forefemur and foretibia yellowish; all other segments white. Tarsal joinings of middle and hindleg finely black. *Wings:* Clear hyaline; wingveins colorless. Stigmatic area of forewing milky, translucent; crossveins simple, strongly slanting, with a few short horizontal veins between. Paired intercalaries of first interspace very long, those of second and third interspace longer than those following. Hindwing with strong costal projection and three longitudinal veins, the third very short and close to hind margin; first and second veins convergent distally; intercalaries not present. *Abdomen:* Segment 1 and 7–10 dark brown. Segments 2–6 hyaline, thinly washed with dark brown, anterior margins of tergites edged with black. A dark geminate line along pleural fold. Each spiracle of middle segments strongly marked with outline of small circle, dark tracheal lines extending onto tergites and sternites from these circles. *Genitalia:* Genitalia of the *intercaleris* type; smoky brown with first segment dark brown at base. *Tails:* Milky white, first few basal segments light smoky.

Nymph (in alcohol)

The pale nymph has light brown dorsum with tergites 5 and 9

pale; tergite 5 with a pair of small dark submedian spots. Anterior margins of tergites narrowly black. Tergites 1–7 with small black mark at base of each gill. Femoro-tibial knees black. Middle tail two-thirds as long as outer tails.

Holotype: Male imago, collected by Helen L. Day and the author on RUSSIAN RIVER, near GEYSERVILLE, SONOMA COUNTY, CALIFORNIA, October 15, 1949, in California Academy of Sciences collection. *Paratypes*, all topotypical: 5 ♂ in Canadian National collection; 5 ♂ in Cornell University collection; 5 ♂ to G. F. Edmunds, Jr.; 35 ♂ in author's collection; 50 ♂ collected November 12, 1949, in author's collection.

Diagnosis: Lacking a tubercle on the inner margin of the basal joint of the forceps, *B. alius* Day, with genitalia of the *intercaleris* type, has no known close relative in California. The adults swarm some six to ten feet above the water from 10:30 A.M. to 3:00 P.M.

Baetis sulfurosus Day, new species

(Figures 7 and 8)

Male imago (in alcohol)

Length: Body 4.0 mm.; forewing 4.0 mm.; foreleg 3.75 mm.; tails 10.0 mm. *Head:* Clypeus and face brown; vertex pale yellow with narrow black Y-shaped mark based on posterior margin and opening forward. Antenna brown, set in wide white circular sclerites. Eyes .6 mm. on longest diameter; stalks .25 mm. in height measured up the outer side. *Thorax:* Notum blackish brown. Mesonotum with median furrow and outline of scutum black; scutellum pale at base and a pair of small pale spots anterior to pale area. Tergum brown, median sclerites outlined in black. *Legs:* Coxae and trochanters brown, margins finely black; all other segments light smoky brown. *Wings:* Forewing hyaline, stigmatic area milky white. Subcosta and R_1 brown; other longitudinal veins usually finely dark and crossveins pale; crossveins of stigmatic area often dark and sometimes tending to anastomosis. First interspace with a single marginal intercalary. Hindwing with costa dark before the projection, and other veins dark in basal one-third; sometimes with an intercalary between second and third veins. *Abdomen:* Tergite 1 blackish brown; 7–9 paler; 2–6 hyaline smoky brown. Sternite 1 and 7–9 yellow brown; 2–6 hyaline yellow. *Genitalia:* Genitalia of the *intercaleris* type; first and second segments of forceps pale smoky brown, dark brown at base of first segment; third and fourth segments pale smoky, edged with black when seen in ventral or dorsal view; fourth segment one-half the length of third segment. *Tails:* Milky white, a few basal segments very faintly smoky.

Holotype: Male imago, collected by Helen L. Day and the author on the P. C. Hale Ranch, SULPHUR CREEK, SONOMA COUNTY, CALIFORNIA, August 25, 1951, in California Academy of Sciences collection. *Paratypes*, all topotypical: 5 ♂ in Canadian National collection; 5 ♂ in Cornell University collection; 5 ♂ to G. F.

Edmunds, Jr.; 65 ♂ in author's collection. 25 ♂ from Capell Creek, Napa County, California, collected on May 20, 1950, in author's collection.

Diagnosis: B. sulfurosus Day is quite close to *B. thermophilos* McDunnough, the latter described from Yellowstone Park, Wyoming. Apart from being smaller and much paler, *B. sulfurosus* has the third vein of the hindwing closer to the posterior margin of the wing, and the fourth segment of the forceps is proportionately only about one-half as long as that of *B. thermophilos.*

B. sulfurosus is undoubtedly the "closely allied species . . . from Cloverdale, California," mentioned by Traver in discussing *B. thermophilos*, p. 702, Biology of Mayflies. The confluence of Sulphur Creek with the Russian River is about two miles north of Cloverdale.

With shade temperature at 96° F., *B. sulfurosus* was found swarming at noon fully one-quarter mile from the stream. Having plenty of tree-shade available, this species preferred to swarm in the open, three or four feet above bare rock and gravel.

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A CHECK LIST OF THE GENERA & SPECIES OF MALLOPHAGA. By G. H. E. Hopkins and Theresa Clay. Pp. [6+] 1–361. Published by the Trustees of the British Museum, London. Issued April 1, 1952. Price £2.

This is a model check list; it is a pleasure to use. The listing of genera, and of species within the genera, is alphabetical. All specific names which have been proposed in a given genus are entered under that generic name. By using different type faces the authors indicate which names they consider to represent valid generic or specific concepts, which are synonyms, and which have been removed to other genera. In the last two instances there are cross-reference entries. Type species are cited. Hosts are given wherever known, and corrections suggested for records thought to be erroneous.

The list is based on a study of the world fauna, hence many genera proposed in regional works are synonymized. It is difficult to tell how many generic synonymies are original in this book; some are based on unpublished findings (p. 255: "Although separate from *Otidoecus* if only the described species are considered, undescribed species completely bridge the gap between the two groups."). Pages 1 to 17 are introductory and explain the authors' nomenclatorial concepts and working procedure.—H. B. Leech.

A NEW NORTHWESTERN MELANDRYID

(Coleoptera: Melandryidae)

BORYS MALKIN
University of Washington

Emmesa testacea leeperi Malkin, n. subsp.

Elongate, narrow black except for red coloration of sides of thorax. *Head* closely and deeply punctured, frons with shallow fovea in center. Antennae fuscous, slightly longer than prothorax. Second antennal segment short, first segment 1½ times as long as second, third segment subequal to first, fourth 1½ times as long as third and equal to fifth. Last three segments rugose longitudinally. *Prothorax* 1.4 as wide as long, shining, deeply punctured, wider at base than at front, anterior margin truncate, sides arcuate, expanding posteriorly and attaining greatest width one-third from base. Base of the prothorax bisinuate, with a shallow longitudinal pit and a notch in the middle, sides widely red, disc with subquadrate dark cloud. *Elytra* three times as long as wide, pubescent, coarsely but regularly punctured, punctures sub-muricate. *Ventral surface* black to piceous except posterior half of inflexed margin of thorax, which is red. Abdominal segments sparsely punctured in middle, more closely on the sides, horizontally finely muricate. *Legs* piceous to rufous. Anterior and middle tibia with a spur each, posterior tibia with two spurs. Tarsal segments: in protarsi first only slightly longer than second, second one-third as long as the third, third longer than fourth. In metatarsi first segment extremely elongated almost half length of tibia and twice as long as second segment which in turn is three times as long as third. In metatarsi, first segment as long as all others together. Tarsal claws simple. Length: 9.6 mm. Width: 3.2 mm.

Holotype male: MUNSEL LAKE, 4 mi. N. of FLORENCE, LANE CO., OREGON, 14.VI.1950 *(B. Malkin* and *R. L. Leeper)*, found floating in lake's drift. In California Academy of Sciences collection. *Paratypes* all males: 1, EUGENE, OREGON 23–30.V.1946 *(B. Malkin)*; 1, GENOA BAY, DUNCAN, BRITISH COLUMBIA, 14.VI.1928 *(W. Mathers)*, from R. Hopping collection; 1, MANCHESTER, WASHINGTON 27 May, 1934. The paratypes will be distributed as follows: Eugene paratype in Malkin collection, British Columbia paratype in the C.A.S. collection, the Manchester paratype in the Hatch collection.

The paratypes show considerable diversion from the type, particularly in the emargination of the posterior end of the prothorax. The median notch is more pronounced in all of them than in the type and the Washington specimen is actually deeply bilobed at the base.

This new subspecies is almost indistinguishable from *E. t. testacea* Van Dyke. The genitalia of the both forms are identical.

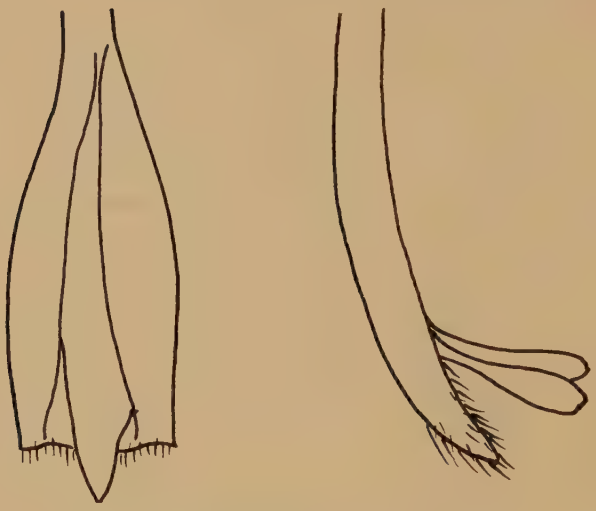

Fig. 1. Male genitalia of *Emmesa testacea leeperi.*

However, *E. t. leeperi* is black throughout while *E. t. testacea* is pale yellow. So far as the available material shows there is a sharp territorial difference, *E. t. testacea* being centered around the San Francisco bay area in California, while *E. t. leeperi* is found along the coast north of the California border. The distributional difference plus the color difference justify setting apart the new subspecies.

E. testacea leeperi is named after Dr. R. L. Leeper of the University of Oregon who pointed out to me the type specimens floating in the lake. Mr. Hugh B. Leech of the California Academy of Sciences has kindly loaned the British Columbia specimen and also examples of the typical subspecies and several other closely related species for comparison, while Dr. M. H. Hatch contributed the Washington specimen.

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DESCRIPTIONS AND RECORDS OF NORTH AMERICAN HOPLITIS AND ANTHOCOPA[1]

(Hymenoptera, Megachilidae)

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In the course of preparing a paper on the Californian species of certain megachilid bees in cooperation with Dr. P. D. Hurd, Jr., of the University of California, several new forms and new distributional records came to light. The present paper has been written in order to bring our knowledge of these recently revised groups up to date and to make certain records and new names available for use in the above mentioned work.

The specimens recorded and described below come from several sources. I am indebted to each of the following for the use of material under his care: Dr. John N. Belkin, University of California at Los Angeles [U. C. L. A.]; Dr. J. Bequaert, Museum of Comparative Zoology [M. C. Z.]; Dr. G. E. Bohart, Bureau of Entomology and Plant Quarantine, Logan, Utah [G. E. B.]; Dr. G. E. Butler, Jr., University of Arizona [U. A.]; Dr. P. D. Hurd, Jr., University of California [U. C., B.]; Dr. L. W. Quate, University of Nebraska [U. N.]; Dr. E. S. Ross, California Academy of Sciences [C. A. S.] and P. H. Timberlake, University of California, Riverside [U. C., R.]. The letters in brackets are used to identify these collections in the following pages.

Considerable material in the Snow Entomological Museum of the University of Kansas [K. U.], mostly collected by Dr. R. H. Beamer or under his direction, is here recorded for the first time.

HOPLITIS BULLIFACIES Michener

Hoplitis (Hoplitina) bullifacies Michener, 1947, Bull. Amer. Mus. Nat. Hist.; 89:274 (female, not male).

This species was described from a few specimens from Inyo County, California. The holotype is a female. The male available at the time was only tentatively associated with the females as it was taken in a different locality. A long series of both sexes now available from Big Pine Creek, Inyo County, CALIFORNIA, 7500 feet altitude, June 12 to 20, 1942 (R. M. Bohart) [G. E. B.] shows that this original association was incorrect. The male originally placed with *bullifacies* is another species, named below as *H.*

[1] Contribution number 868 from the Department of Entomology, University of Kansas.

(Hoplitina) mazourka. The proper male of *bullifacies* is described below:

Male: Length 5.5 to 6.0 mm. Black, metasomal terga one to four red, sometimes with inconspicuous middorsal black areas; fifth tergum red laterally; posterior margins of terga dark testaceous. Clypeus with a strong, shining, impunctate, median protuberance similar to that of female; clypeal margin shallowly concave medially, slightly produced and strongly crenulate sublaterally; inner orbits slightly converging below; antennal scape about four times as long as broad, pedicel much longer than broad, flagellum reaching middle of scutellum, segments all much longer than broad, first six subequal in length and slightly more than twice as long as broad, following segments successively shorter, the last the shortest segment of the flagellum; mandibular teeth subequal; maxillary palpi as in female. Middle coxae each with small shining ventral projection or tooth based of trochanter. Sixth metasomal tergum without lateral teeth; seventh tergum with broad dorsal concavity, apical margin with small apical notch (fig. 1). First metasomal sternum with strong protuberance, abruptly declivous posteriorly; second sternum with posterior margin broadly convex, fringed; third fringed, emarginate medially; fourth and fifth unfringed, slightly emarginate medially; sixth with deep median pit from which arises a short, blunt process bearing numerous short hairs; gonoforceps robust, median portions parallel-sided, apices tapering to blunt points, outer apical margins with long fringes.

Hoplitis mazourka Michener, new species

Hoplitis (Hoplitina) bullifacies Michener, 1947, Bull. Amer. Mus. Nat. Hist.; 89:275 (male, not female).

This form, a member of the subgenus *Hoplitina*, is adequately described in the paper cited above. It differs from true male of *bullifacies*, described above, in having short antennae and dentate lateral margins of the sixth metasomal tergum, as well as in many other characters.

Holotype male: MAZOURKA CANYON, INYO MOUNTAINS, INYO COUNTY, CALIFORNIA, 7500 feet altitude, on *Cryptantha*, May 21, 1937 (C. D. Michener) [K. U.].

A second specimen of *H. mazourka* from Kramer Junction, San Bernardino County, California, April 20, 1953 (R. O. Schuster) [U. C., B.] has recently been received. It is not designated a paratype because of the darker margins of the metasomal terga and the absence of the weak median emargination of the seventh tergum but it seems certainly conspecific.

HOPLITIS TRUNCATA TRUNCATA (Cresson)

WYOMING: Newcastle, June (M. Cary) [U. N.]. SOUTH DAKOTA: Custer [U. N.]. NEBRASKA: Glen, Sioux County, 4000 feet altitude, August 20, 1906, on *Cleome* (H. S. Smith); War Bonnet Canyon, Sioux County, on *Pentstemon* (J. C. Crawford) [all U. N.].

HOPLITIS TRUNCATA MESCALERIUM (Cockerell)

COLORADO: Ute Creek, 9000 feet altitude, July 11 (R. W. Dawson) [U. N.]. ARIZONA: Williams, 7000 feet altitude, June 15, 1925 (A. A. Nichol) [U. A.]; White Mountains, June 19, 1950 (P. P. Cook) [K. U.]; Oak Creek Canyon, June 26, 1950 (L. D. Beamer) [K. U.].

This species has not previously been known west of central Colorado and New Mexico.

All of the specimens of the species *truncata* recorded above from Colorado, Wyoming, South Dakota, and Nebraska exhibit characters intermediate between the two subspecies. The Colorado specimen (a single female) is nearer to *mescalerium* while those from Wyoming, South Dakota, and Nebraska are nearer to *truncata*.

HOPLITIS PRODUCTA INTERIOR Michener

COLORADO: Artesia, Moffat County, on *Helianthus petiolaris*, July 23, 1950 (C. D. Michener) [K. U.]. WYOMING: Laramie, some on *Pentstemon angustifolium*, June 9, 1952 (R. H. Beamer, L. D. Beamer, W. E. LeBerge) [K. U.]. UTAH: Park City, June 11, 1952 (A. E. Wolf, C. H. Winer) [K. U.].

HOPLITIS GRINNELLI GRINNELLI (Cockerell)

BAJA CALIFORNIA: El Mayor, April, 1939 (C. D. Michener) [K. U.]. NEVADA: Twenty-two miles south of Las Vegas, on *Sphaeralcea ambigua*, April 3, 1953 (J. W. MacSwain) [U. C., B.].

HOPLITIS GRINNELLI SEPTENTRIONALIS Michener

IDAHO: Cub River Canyon, Franklin County, on *Pentstemon cyananthus*, June 1, 1948 (G. E. Bohart) [G. E. B.]. UTAH: Logan, on *Phacelia linearis*, June 4, 1948 (G. E. Bohart) [G. E. B.].

HOPLITIS UVULALIS (Cockerell)

IDAHO: Willow Flat, Franklin County, July 27, 1950 (C. D. Michener) [K. U.]. This is a new state record.

HOPLITIS HYPOCRITA (Cockerell)

ARIZONA: Santa Catalina Mountains, March 13, 1938 (R. H. Crandall); Sabino Canyon, February 24, 1938 (R. H. Crandall) [all U. A.].

HOPLITIS ALBIFRONS ARGENTIFRONS (Cresson)

NEBRASKA: War Bonnet Canyon, Sioux County, July 21, 1901 (M. Cary); Badlands north of Monroe Canyon, Sioux County, on *Astragalus*, June 24, 1901 (M. Cary) [all U. N.].

This is the first record of this form east of the Rocky Mountain states.

HOPLITIS LAEVIBULLATA (Michener), **new combination**

Anthocopa (Eremosmia) laevibullata Michener, 1943, Ann. Ent. Soc. Amer., 36:68 (female).

Hoplitis (Acrosmia) perissocera Michener, 1947, Bull. Amer. Mus. Nat. Hist., 89:299 (male) **(new synonym).**

Both sexes of this species were collected in numbers at Pinecrest, Tuolumne County, CALIFORNIA, July 16, 1952, on a low growing *Nemophila* (R. Snelling, J. I. Stage). (An additional specimen from the same locality was collected on June 29, by J. I. Stage). The association of sexes indicated by the above synonymy is thus established.

A female specimen previously recorded from Hanna, UTAH, July 14, 1949 (R. H. Beamer) [K. U.] and another from Logan, Utah, June 16, 1947 (G. E. Bohart) [G. E. B.] differ from California material in having the clypeal truncation wider, about equal in width to the distance from the end of the truncation to the lateral angle of the clypeus.

The subgenus *Acrosmia* is more similar to *Anthocopa* than is any other American group of *Hoplitis*. It has the robust body form typical of *Anthocopa*, particularly in the female. The first metasomal tergum has the anterior surface flat, not convex as in most *Hoplitis*. However, there is a distinct longitudinal sulcus in this surface, as in *Hoplitis*. Other features suggesting placement in *Hoplitis* are the absence of carinae on the rear coxae and the presence of a tooth (weak and blunt) on each side of the sixth metasomal tergum of the male. In addition to *H. laevibullata* this subgenus contains *H. plagiostoma* Michener and the new species, *rufina*, described below.

HOPLITIS PLAGIOSTOMA Michener

The following record, based on a single male, is the second known locality for this species. OREGON: Fish Lake, Steens Mountains, 7000 feet altitude, July 11, 1927 (H. A. Scullen) [U. C., R.].

Hoplitis rufina Michener, new species

This is a species of the subgenus *Acrosmia* which differs from the other known species by the red abdomen. In the deeply emarginate seventh metasomal tergum of the male this species most nearly resembles *H. laevibullata* (Michener) but it differs from that form morphologically in the rounded median apical projection of the seventh sternum. The female differs from that of *laevibullata* not only in color but in the punctate clypeal swelling, the longer

clypeal trunctation demarked by distinct angles, and other characters.

Female: Length 7 mm. (varying to 6 mm. among paratypes). Black with mandibles apically and under surfaces of flagella slightly brownish, tergulae brown, metasomal terga red except that sixth is black and extreme sides of fifth are infuscated (subapical dark band on fifth in specimen from Oregon). Wings brown, veins and stigma brownish black. Pubescence white, rather sparse, not forming bands on metasomal terga except laterally on first; sixth tergum with pale hairs scattered over surface. Head about as long as broad, inner orbits slightly converging below; clypeal truncation slightly broader than distance from end of truncation to lateral angle of clypeus, ends of truncation each demarked by distinct, slightly produced angle and middle of truncation also slightly produced so that the clypeal margin has three feeble projections (fig. 3); upper three-fourths of clypeus strongly convex; clypeus coarsely punctate, the punctures longitudinally elongate, especially anteriorly, wide smooth interspaces between punctures on median portion of convexity; remainder of head finely punctured, particularly finely and closely so on frons; median ocellus twice as far from antennal bases as from posterior margin of vertex; distance between posterior ocelli equal to distance from one of them to eye margin and to posterior margin of vertex; mandibular teeth equidistant; maxillary palpi five segmented, third segment much longer than the others, which are subequal in length. Mesonotum and scutellum slightly more coarsely punctate than vertex; mesepisterna more coarsely so than scutum; enclosure of propodeum granular throughout. Hind tibial spurs pale brown, curved apically. Abdomen with punctures shallow, mostly separated by several diameters, but fully as large as those of mesoscutum; surface between punctures shining but minutely roughened, particularly on posterior margins of the terga where punctures are weak and inconspicuous.

Male: Length 6 mm. Coloration similar to female but antennal flagella paler brown except for dark last segment; tegulae nearly black; fifth and sixth metasomal terga black except for reddish translucent apices, seventh black. Pubescence sparse and pale as in female except that face is largely covered with long white hair (largely worn off in allotype). Head much broader than long, finely and densely punctate except for hypostomal and lower genal areas where punctures are widely separated; inner orbits parallel; clypeus scarcely extending below lower ends of eyes, margin shining and impunctate, median portion made crenulate by five small convexities of which the median is broadest; median crenulate portion of margin exceeding lateral portions; antennal scape over four times as long as broad; last flagellar segment longer and broader than others, produced to one side to form a pointed process shorter than in *laevibullata* (process narrowly rounded in Utah specimen); first flagellar segment next in length, longer than broad; second and following segments about as broad as long; flagellar segments two to six with some long hairs on lower margin (short, few, perhaps worn or broken in allotype, long and curved as in other *Acrosmia* in specimen from Utah). Thoracic and abdominal sculpturing much as in female. Sixth metasomal tergum with a tooth at each side, seventh strongly

bilobed, lobes narrower than emargination between them, the latter deeper than a semicircle; exposed sterna as in *laevibullata* but sixth metasomal sternum with median process rounded, apparently not constricted basally.

Of the six known specimens of this species, no two have been collected at the same place. As indicated below, some of the specimens are not included among the paratypes because they are from remote localities and exhibit minor differences from the type series as indicated in parentheses in the description above.

Holotype female: MADERA COUNTY, CALIFORNIA, 3000 feet altitude, May 27, 1938 (R. M. Bohart) [C. A. S.]. *Allotype* male: Big Pine Creek, Inyo County, California, 7500 feet altitude, June 12, 1942 (R. M. Bohart) [C. A. S.]. One female paratype: Pine Flat, Tulare County, on *Viola purpurea*, May 3, 1947 (P. H. Timberlake) [U. C., R.].

Three additional specimens are from the following localities: CALIFORNIA: Tetley Park, San Bernardino Mountains, on *Nemophila*, May 23, 1936 (E. G. Linsley) [U. C., B.]. OREGON: Camp Abbot, Deschutes County, June 4, 1944 (P. A. Arnaud). UTAH: Logan Canyon, May 27, 1938 (Bischoff) [G. E. B.].

HOPLITIS BISCUTELLAE (Cockerell)

NEVADA: Twenty-two miles south of Las Vegas, on compositae and *Sphaeralcea ambigua*, April 3, 1953 (J. W. MacSwain); six miles south of Las Vegas, April 6, 1953 (R. F. Smith, J. Linsley) [all U. C., B.]. UTAH: Zion National Park [G. E. B.]. These are new state records.

ANTHOCOPA ELONGATA (Michener)

MONTANA: Lake St. Marys, Glacier National Park, June 1, 1938 (E. C. Van Dyke) [K. U.]. WASHINGTON: Sunrise, Mount Ranier, July 11, 1934 (O. Bryant) [C. A. S.]. These are new state records.

Anthocopa anthodyta bequaerti Michener, new subspecies

This form is distinguishable from typical *anthodyta* from California by the shape of the seventh metasomal tergum in the male, which has large lateral lobes, as long as the median spine of this tergum. The lateral margins of the tergum are slightly more convex than usual in typical *anthodyta*. In other respects, including the medially narrowed mandibles of the female and the long white apical fringe on the fourth metasomal sternum of the males, *bequaerti* resembles *anthodyta*.

Holotype male, *allotype* female, and two paratypes of each sex. BOX CANYON, SANTA RITA MOUNTAINS, ARIZONA, on red *Pent-*

stemon, April 23, 1949 (J. Bequaert) [M. C. Z.]. A pair of paratypes is in the Snow Entomological Museum.

Anthocopa arizonensis Michener, new species

This species of the subgenus *Atoposmia* is closely related to *A. anthodyta* Michener but differs by the largely ferruginous tegulae, the ferruginous tibial spurs, and the more coarsely punctured posterior part of the abdomen.

Female: Length 7 mm. Agrees with the description of *A. anthodyta* (Michener, 1943) and with specimens of that species except in the following particulars: Clypeus distinctly red along anterior margin, its surface more convex than in *anthodyta*, the punctures medially separated by a little shining ground, a longitudinal median raised line (more noticeable in some paratypes than in holotype) present; mandibles much narrowed medially but not quite so much so as in *anthodyta*, so that length along lower margin is slightly less than four times shortest breadth; distance from subapical inner swelling to apex of third tooth much less than shortest width of mandibles. Tegulae ferruginous, dusky or black anteriorly; tibial spurs ferruginous. Abdomen with posterior margins of terga broadly transluscent brown; punctures of abdomen unusually coarse, those of center of second tergum separated by one to two puncture widths, those of centers of third, fourth and fifth terga closer, many of them fully as large as largest punctures of mesoscutum.

Holotype female: GRAND CANYON, ARIZONA, June 7, 1940 (R. M. Bohart) [C. A. S.]. One female paratype, same data, 7000 feet altitude [U. C. L. A.]; one female paratype, same data, June 5, 1940 [K. U.]. One female paratype: Jacob Lake, Arizona, 8000 feet altitude, June 13, 1940 (R. M. Bohart) [U. C. L. A.].

ANTHOCOPA ABJECTA (Cresson)

Osmia abjecta Cresson, 1878, Trans. Amer. Ent. Soc., 7:103.
Hoplitis mesae Cockerell, 1930, Amer. Mus. Novitates, 397:2 **(new synonym).**
Anthocopa nigrior Michener, 1943, Ann. Ent. Soc. Amer., 36:54 (female, not male) **(new synonym).**

Larger series of *abjecta* than were available in 1943 show that the female described as *nigrior* is indistinguishable from individuals in Utah and Colorado populations of *abjecta*. The male described under *nigrior* is quite different from the male of *abjecta* and probably represents a distinct species whose female is unknown. It was unfortunate that it was associated with *nigrior* since it was not collected with the female specimens assigned to that species.

A re-study of the type of *mesae*, kindly lent for examination by Dr. M. A. Cazier of the American Museum of Natural History, shows that it is the male of *abjecta*, as was suggested earlier

(Michener, 1943). The dark pubescence is nearly all worn off of the legs and abdomen, but is still recognizable.

Male: Agrees with description of male of *alta* (Michener, 1943) except that distance between posterior ocelli is often equal to distance to posterior margin of vertex and to distance from ocelli to eye margin. Pubescence of head and thorax entirely pale as in *alta* but legs with pubescence largely black or fuscous; abdomen with much fuscous hair, the pale bands inconspicuous, sometimes visible only on first tergum, in other individuals evident on first four terga.

UTAH: Park City, on *Pentstemon moffatti*, June 11, 1952 (A. E. Wolf, W. E. LaBerge, Cheng Liang) [K. U.]; twenty miles east of Salt Lake City, June 11, 1952 (Cheng Liang) [K. U.]; Allen Canyon, July 3, 1950 (G. F. Knowlton, S. L. Wood) [G. E. B.]. COLORADO: Monarch Pass, July 5, 1949 (R. H. Beamer) [K. U.]; Trout Creek Pass, July 5, 1949 (J. R. White) [K. U.]; Science Lodge, west Boulder County, July 6, 1939 (U. N. Lanham) [K. U.]; Beaver Reservoir, on *Penstemon alpinus*, July 1, 1939 (P. H. Timberlake) [U. C., R.].

Anthocopa hebitis Michener, new species

This species, a member of the subgenus *Atopsomia*, is related to *A. pycnognatha* Michener with which it agrees in the short maxillary palpi and the ferruginous tegulae and tibial spurs. It differs from *pycnognatha* and from all other *Atoposmia* in the exceedingly fine and close punctuation of the face, vertex and dorsum of the thorax, there being no interspaces between punctures. It also differs from all other *Atoposmia* in the hind basitarsi; in the female they are finely and closely punctured, dull, and almost 2.3 times as long as broad. In the male they are somewhat less dull, 2.5 times long as broad. In all other species the hind basitarsi are shining, rather coarsely punctured, and comparable ratios are 2.5 to 3.0 for females, 3.0 to 4.0 for males. In the male of *hebitis* the lateral margins of the sixth metasomal tergum are relatively straight, not convex as in *pycnognatha*.

Female: Length 7 mm. Pubescence pale brownish, yellow on under surfaces of tarsi, whitish on sides of head and thorax. Punctation of head and thorax fine and close, no interspace between punctures in most areas; punctures of clypeus scarcely coarser than those of frons, those of mesoscutum somewhat coarser than those of vertex; anterior ocellus somewhat behind midpoint between posterior edge of vertex and antennal bases; distance between posterior ocelli slightly shorter than distance from one of them to eye margin, more distinctly shorter than distance to posterior margin of vertex; pubescence of genal areas abundant, depressed, and directed forward; punctation of genal areas particularly fine and close; clypeal truncation

about as long as distance from its rounded end to lateral angle of clypeus; mandibles slightly less than three times as long as shortest breadth, tridentate, subapical dorsal swelling rounded, distant from apex of third tooth by about one-third shortest breadth of mandibles; maxillary palpi little more than half as long as first segment of labial palpi, five-segmented but last segment short and exceedingly minute, third segment longer than the others, first, second and fourth subequal in length. Dorsum of thorax finely and closely punctured but somewhat more coarsely so than vertex; mesepisterna more coarsely punctured than mesoscutum, punctures slightly separated by shining ground; enclosure of propodeum somewhat roughened above; tegulae reddish brown, infuscated anteriorly; hind tibial spurs reddish brown, somewhat curved apically; hind basitarsi dull, minutely punctured, parallel-sided basally, tapering apically, 2.3 times as long as broad. Abdomen strongly punctured, the coarser punctures of sides of terga coarser than those of any part of thorax, punctures of middorsal parts of first three metasomal terga separated by less than a puncture width in most places and extending almost to posterior margins of terga; punctures of fourth tergum closer than those of preceding terga; punctures of fifth and sixth terga finer and about as close as possible; scopa yellowish white, short, hairs of second sternum not much longer than length of exposed portion of sternum; apical pubescent bands of terga broken medially on first three terga.

Male: Length 9 mm. Similar to female in appearance and punctation. Clypeus but little more finely punctured than rest of head; distance between posterior ocelli equal to distance from one of them to eye margin and to distance to posterior margin of vertex; clypeal truncation slightly produced, demarked by distinct angles, much longer than distance from end of truncation to lateral angle of clypeus; margin of truncation slightly crenulate, narrowly impunctate. Punctation of mesoscutum scarcely coarser than that of vertex. Third metasomal sternum with conspicuous, broad, fringed emargination; sixth tergum with strong tooth at each side, the apex of which is distinctly acute, laterally this tergum not strongly convex; seventh tergum with median tooth slightly exceeding the distinct lateral lobes; posterior margins of terga much more broadly reddish brown than in female.

Holotype female: MINERALKING, TULARE COUNTY, CALIFORNIA, July 31, 1935 (G. E. Bohart). This specimen is being deposited at Dr. Bohart's request in the California Academy of Sciences.

Because it was not collected at the same place, the male specimen, from Huntington Lake, Fresno County, California, August, 1917 (I. McCracken) [C. A. S.] has not been designated as an allotype.

Anthocopa rubrella macswaini Michener, new subspecies

Female: Length 5 mm. (varying to 4 mm. among paratypes). Agrees with typical *rubrella* Michener (from Texas) but is smaller (*rubrella* ranges from 5.6 to 7 mm. in length), with the median pair of small lobes on the clypeal margin broader, each consistently half as wide as the lateral apical lobes formed by the ends of the clypeal truncation.

Male: Length 5 mm. (varying to 4 mm. among paratypes). Agrees with typical *rubrella* except for smaller size.

Holotype female, *allotype* male, and two female and eight male paratypes: TWO MILES SOUTH OF BAKER, SAN BERNARDINO COUNTY, CALIFORNIA, April 4, 1953 (J. W. MacSwain [U. C., B.]. One male paratype: seven miles north of Vidal Junction, San Bernardino County, California, April 3, 1951 (P. D. Hurd) [U. C., B.].

The holotype and allotype are placed in the Snow Entomological Museum, University of Kansas.

A single male from twenty-two miles south of Las Vegas, Nevada, April 3, 1953 (J. W. MacSwain) [U. C., B.] is referred to this subsepcies.

A single male, large enough to be typical *rubrella*, is from San Carlos Bay, SONORA, MEXICO, on *Dalea*, April 8, 1952 (L. D. Anderson) [U. C., R.].

Anthocopa rubrella rubrior Michener, new subspecies

Female: Length 5 mm. (varying to 4.5 mm. among paratypes). Agrees with typical *rubrella* Michener (from Texas) except for the smaller size, the broader median lobes of the clypeal margin (each of which is nearly as wide as the lateral apical lobes formed by the ends of the clypeal truncation), and the larger amount of red coloration, as follows: mandibles except bases and apices, apical margin of clypeus, tegulae, posterior lobes of pronotum (black in some paratypes), posterior femora (largely black in some paratypes), inner surfaces of posterior tibiae (black in some paratypes), and entire metasoma, infuscated on sixth tergum and sternum. (In some paratypes middorsal areas on fourth and fifth terga, basal portion of sixth tergum and entire fifth and sixth sterna black). The pubescence seems denser and whiter than that of either *rubrella* proper or *macswaini*.

Male: Length 5.5 mm. (varying to 5 mm. among paratypes). Agrees with typical *rubrella* except in coloration, which is as in the female.

Holotype female, *allotype* male and one male paratype: HOPKINS WELL, RIVERSIDE COUNTY, CALIFORNIA, April 29, 1952 (J. G. Rozen) [U. C., B.]. One female paratype: twenty-four miles south of Indio, California, on *Dalea mollis*, March 25, 1933 (P. H. Timberlake) [U. C., R.]. One female paratype: eighteen miles west of Blythe, California, on *Dalea mollis*, April 30, 1952 (P. H. Timberlake) [U. C., R.]. One female paratype: Anza State Park, San Diego County, California, April 23, 1951 (R. C. Bechtel) [U. C., D.]. One male paratype: Borego, San Diego County, California, May 2, 1952 (J. G. Rozen) [U. C., B.].

The holotype and allotype are placed in the Snow Entomological Museum, University of Kansas.

This subspecies is much more different from the Texan *rubrella* than is *macswaini* from San Bernardino County. The latter is intermediate in certain respects. Nonetheless it is possible that *rubrior*

represents a different species but this probably will not be clear unless *rubrior* and *macswaini* are found to occur in the same area.

Anthocopa hurdiana Michener, new species

This form is similar to *A. rubrella macswaini*, differing in the simple truncate clypeal margin of the female, the less convex and less shining upper part of the clypeus of the female, the slightly narrower genal areas of the female, the position of the ocelli slightly nearer to the posterior edge of the vertex in the female, and the slightly narrower head in the male.

Female: Length 5 mm. Agrees with the description of *A. rubrella* (Michener, 1949) except as follows: Clypeus truncate, truncation shorter than distance from its end to lateral angle of clypeus; upper two-thirds of clypeus less convex, its punctures rather close, much larger than those elsewhere on head; median ocellus about twice as far from antennal bases as from posterior edge of vertex; distance between posterior ocelli equal to distance from one of them to eye margin, much greater than distance to posterior edge of vertex; genal areas about half as wide as eye, seen from side. Tegulae brown, infuscated anteriorly; punctation of mesoscutum like that of vertex, that of mesepisterna slightly sparser. Second metasomal tergum with black spot dorsally, third largely black dorsally.

Male: Length 5 mm. Differs from the description of *A. rubrella* as follows: Inner margins of eyes distinctly converging below.

Holotype female, *allotype* male, and one female paratype: Surprise Canyon, Inyo County, California, on *Dalea fremontii*, April 28, 1953 (P. D. Hurd) [U. C., B.]. The holotype and allotype are in the Snow Entomological Museum, University of Kansas.

Anthocopa namatophila Michener, new species

This small black species is a member of the subgenus *Phaeosmia*, in so far as can be determined from the female alone. In size and in the presence of an apical flange, not hidden by a subapical fascia, on the sixth tergum, this species resembles *A. rubrella* Michener, *maryae* Michener and *hurdiana* Michener. It differs from the first two by the unmodified clypeal margin.

Females: Length 5 mm. Pubescence white, brushes of hair under margin of clypeus short but rather broad and orange, mandibles with some orange hair on outer surfaces but not forming a definite brush. Inner margins of eyes slightly converging below; anterior margin of clypeus produced to a broadly rounded truncation with rounded ends, length of truncation about equal to distance from end of truncation to lateral angle of clypeus, produced anterior marginal area of clypeus not directed forward; head rather finely punctured, punctures not widely separated, those of clypeus coarser than on rest of head; upper two-thirds of clypeus but little more strongly convex than lower third of clypeus and slightly more coarsely punctured than lower third; lower third with punctures exceedingly close except for the narrow impunc-

tate apical margin of truncation; anterior margin of clypeus rather broadly red; anterior ocellus twice as far from antennal bases as from posterior edge of vertex; distance between posterior ocelli about equal to distance from one of them to eye margin, nearly twice distance from one of them to posterior margin of vertex; mandibles red except basally, subapical inner swelling rather high and obliquely truncate distally, apex of median mandibular tooth about equidistant between apices of upper and lower teeth; maxillary palpi short, five-segmented, second and third segments subequal and longer than any of the others; first segment of labial palpus about half as long as second. Thorax about as coarsely punctate as head, disc of mesoscutum with punctures slightly more widely separated than those of vertex; mesepisternum with punctures slightly finer than those of mesoscutum, more widely separated than and slightly coarser than those of genal areas; upper portion of enclosure of propodeum slightly roughened, lower portion shining; tegulae testaceous, infuscated anteriorly; hind tibial spurs testaceous, slightly curved at apices; wings faintly dusky. Abdomen distinctly punctured; punctures of central portion of second tergum slightly finer than those of mesoscutum, separated by about a puncture width; posterior margins of terga broadly brownish with a distinct impunctate zone along the margin proper in front of which is a region of fine punctation; posterior margins of terga with bands of white pubescence which are not dense enough to obscure the brownish margins of the terga; sixth tergum without a subapical band of hairs but with scattered distinct white hairs over entire surface and with a brownish flange along posterior margin; scopa white.

Holotype female and three female paratypes: SEVEN AND ONE-HALF MILES SOUTH OF TWENTY-NINE PALMS, CALIFORNIA, on *Nama demissum,* May 7, 1949 (P. H. Timberlake) [U. C., R.].

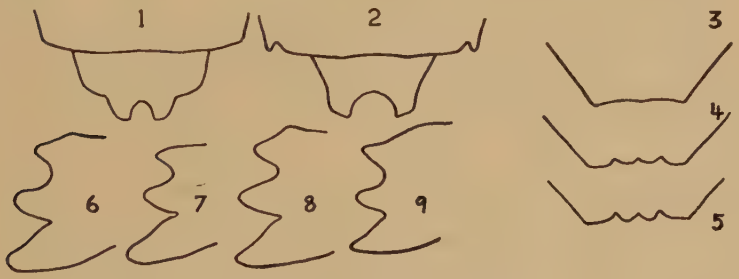
Anthocopa segregata Michener, new species

Anthocopa robustula, Michener, 1943, Ann. Ent. Soc. Amer., 36:71 (Kearsarge record only).

Specimens of this species have been confused in collections with *A. robustula* (Cockerell). They differ particularly in the coarser punctation of the upper, convex part of the clypeus of the female, this region being conspicuously more coarsely punctured than any other part of the head. Also the subapical swelling of the inner margin of the mandible is weak and gently rounded, not strong and truncated apically as in *robustula*. The species is also close to *A. hypostomalis* Michener but differs in having the hypostomal carinae low with the longitudinal portions longer than the transverse portions.

Female: Length 8 mm. (paratype 7 mm.) Pubescence white, brushes of hair under margin of clypeus broad, rather long, orange; mandibles without brushes of orange hair on other surfaces. Inner margins of eyes very slightly diverging below; anterior margin of clypeus produced to a broadly rounded truncation with rounded ends, length of truncation about equal to distance from end of truncation to lateral angle of clypeus, produced portion of clypeus

not directed anteriorly; head finely punctate except for clypeus which has punctures much coarser than those elsewhere; upper two-thirds of clypeus distinctly convex, its punctures separated by one-third a puncture width; lower flat portion of clypeus with punctures slightly elongated, similarly separated; margin of clypeus impunctate, rather irregularly roughened; punctures of rest of head but little separated; anterior ocellus slightly behind midpoint between antennal bases and posterior edge of vertex; distance from posterior ocellus to eye margin very slightly greater than distance between posterior occelli and about equal to distance from one of them to posterior margin of vertex; mandible slightly reddish throughout, subapical inner swelling low and rounded, apex of median tooth about midway between apices of first and third teeth, narrowest portion of mandible slightly more than one-fourth as long as mandible measured along lower margin; maxillary palpi five-segmented, second and third segments subequal and longer than others. Punctures of thorax coarser than those of top of head, those of



EXPLANATION OF FIGURES

1., Posterior end of abdomen of male of *Hoplitis bullifacies*. 2, Same, *Hoplitis rufina*. 3, Outline of clypeus of female, *Hoplitis rufina*. 4, Same, *Anthocopa rubrella rubrior*. 5, Same, *Anthocopa rubrella macswaini*. 6, Apex of mandible, *Anthocopa segregata*, female. 7, Same, *Anthocopa mirabilis*, male. 8, Same, *Anthocopa namatophila*, female. 9, Same, *Hoplitis rufina*, female.

mesoscutum and mesepisterna separated by about one-fourth a puncture width or slightly more; enclosure of propodeum roughened and dull laterally but smooth to upper margin medially; tegulae testaceous; hind tibial spurs bent apically, testaceous; wings nearly clear. Abdomen distinctly punctured but punctures much smaller than those of thorax, those of center of second tergum separated by two to three puncture widths; posterior margins of terga translucent brownish, very narrowly impunctate, with broad bands of white pubescence; entire sixth tergum with scattered white hairs; scopa white.

Holotype female: MAZOURKA CANYON, INYO MOUNTAINS, INYO COUNTY, CALIFORNIA, on *Parosela fremontii*, May 25, 1937 (C. D. Michener) [K. U.]. Paratype female: near Kearsarge, Inyo County, May 25, 1937 (E. C. Van Dyke) [C. A. S.].

ANTHOCOPA HYPOSTOMALIS Michener

The male of this species is here described for the first time.

Male: Length 7 mm. Similar in appearance to female. Pubescence largely white, that of dorsum of head and thorax yellowish. Inner margins of eyes distinctly diverging below; clypeus much more finely and closely punctured than rest of head, densely covered with white pubescence which obscures surface; anterior margin of truncation shining and crenulate; area behind ocelli not more coarsely punctate than rest of head; mandibles broader at level of apex of inner tooth than medially. Tegulae reddish testaceous; upper part of enclosure of propodeum smooth medially. Abdominal punctation somewhat coarser than in female but finer than that of a mesoscutum; sixth metasomal tergum with posterior margin truncated medially, the truncation continuous with the convex lateral margins, with no emarginations or teeth or lobes laterally and no projecting flange medially; seventh tergum with posterior margin slightly and broadly emarginate medially, scarcely exposed beyond sixth; second and following sterna brown rather than black; second large, its margin narrowly truncate medially; third with posterior margin broadly emarginate with a fringe of long yellowish hairs medially; fourth with posterior margin produced to a small rounded median lobe.

CALIFORNIA: Palm Springs, on *Cryptantha barbigera*, March 30, 1945 (P. H. Timberlake) [U. C., R.]; Surprise Canyon, Inyo County, on *Dalea fremontii*, April 28, 1953 (P. D. Hurd) [U. C., B.].

ANTHOCOPA HEMIZONIAE (Cockerell)

Mr. P. H. Timberlake has obtained a male of this species, hitherto known only from the female. It is described as follows:

Male: Length 9 mm. Similar in appearance to female but pubescence even yellower, particularly that of dorsum of thorax; pubescence of face dense, largely covering surface, yellowish white in color. Inner orbits slightly converging below; head very finely and closely punctured, clypeus more finely so than rest of head; anterior margin of clypeus broadly impunctate with several irregular strong nodules; area behind ocelli not more closely or sparsly punctate than rest of head; mandibles not narrowed apically, breadth at apex of inner tooth equal to breadth near middle. Thorax little if any more coarsely punctate than head; hind tibial spurs slender and brown. Punctures of anterior metasomal terga slightly coarser than those of mesoscutum, separated by about half a puncture width; punctation of posterior terga progressively finer; sixth metasomal tergum medially truncate, this region with a projecting dark brownish flange lateral to which are shallow emarginations separating the truncation from the low, obtuse, rounded, lateral lobes; seventh tergum obtusely angulate medially, sides straight; second metasomal sternum large, its margin rounded, neither truncate nor emarginate but median portion somewhat produced posteriorly, therefore strongly rounded; third sternum with posterior margin nearly straight except for large median emargination filled with long yellowish hairs; posterior margin of fourth sternum broadly rounded.

CALIFORNIA: Gavilan, on *Helianthus gracilentus*, June 9, 1950 (P. H. Timberlake) [U. C., R.].

ANTHOCOPA MALLOGNATHA Michener

NEVADA: Twenty-two miles south of Las Vegas, April 4, 1953, on composite (J. W. MacSwain, E. G. Linsley) [U. C., B.]; six miles south of Las Vegas, April 6, 1953 (Ray F. Smith) [U. C., B.].

Anthocopa mirifica Michener, new species

Anthocopa mortua, Michener, 1943, Ann. Ent. Soc. Amer., 36:78 (female, not male).

The female associated with the male *mortua* in 1943 proves to be quite unrelated to *mortua*, and is here renamed. It is described in the reference cited above. The most distinctive features of *mirifica* are the short clypeal truncation of the female, shorter than the distance from the end of the truncation to the lateral angle of the clypeus, and the short, robust, but tridentate mandibles of the male.

Male: Length 6.6 to 7 mm. Pubescence white, not obscuring surface of clypeus; inner orbits distinctly converging below; head rather coarsely and closely punctate, clypeus more finely and more closely so, particularly anteriorly; anterior margin of clypeus narrowly impunctuate, truncation rounded laterally and much longer than distance from end of truncation to lateral angle of clypeus, medially with broad shallow emargination and median projecting tooth; mandibles short and robust, not narrowed medially, apices tridentate, distance from apex of lower tooth to middle tooth greater than distance from apex of middle tooth to upper tooth. Mesoscutum with punctation little if any coarser than that of vertex; mesepisterna with punctures similar to those of mesoscutum and genal areas; outer and posterior portions of tegulae brown; upper portion of enclosure of propodeum roughened. Metasomal punctation dorsally about as coarse as that of mesoscutum but punctures more widely separated although in most areas separated by no more than a puncture width, laterally punctures even coarser than those of mesoscutum; first five metasomal terga provided with apical bands of white pubescence; sixth tergum broadly truncate posteriorly with no distinct sublateral angles and without a projecting flange; seventh tergum broadly rounded posteriorly; second sternum large, posteiror margin distinctly emarginate medially; third sternum broadly emarginate posteriorly, the emargination completely filled with a very long, yellowish fringe; fourth sternum with margin slightly produced and rounded medially; genital coxopodite robust although tapering to slender apex, hairs visible from above short but under surfaces subapically with rather long hairs.

Since he males associated with *mirifica* were not collected with females, they are not designated as types.

Holotype female: MAZOURKA CANYON, INYO MOUNTAINS, INYO COUNTY, CALIFORNIA, May 25, 1937 (N. W. Frazier) [K. U.]. One female paratype from each of the following localities, all in CALIFORNIA: near Darwin Falls, Argus Mountains, Inyo County, May

30, 1937 (C. D. Michener) [K. U.]; Westgard Pass, Inyo County, June 15, 1937, on *Encelia farinosa* (C. D. Michener) [K. U.]; Box Canyon, on *Chaenactis carphoclinia*, April 21, 1952 (P. H. Timberlake) [U. C. R.]. Eighteen female paratypes from seven miles west of Westgard Pass, Inyo County, California, some on *Encelia farinosa*, June 26, 1953 (J. W. MacSwain, N. Nakakihara, D. D. Linsdale) [U. C., B.].

Males are from Surprise Canyon, Panamint Mountains, Inyo County, California, on *Chaenactis brachypappa*, April 28 and 29, 1953 (P. D. Hurd) [U. C., B.] and (P. H. Timberlake) [U. C., R.].

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CHANGE OF THE SPECIES NAME OF MYZUS LANGEI ESSIG TO MYZUS CALLANGEI ESSIG

E O. Essig

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The specific name of *Myzus langei* Essig 1936 is herewith changed to *Myzus callange* Essig because it is preoccupied by *Myzus langei* Börner 1933. This latter species was first described in the genus *Trilobaphis* (Börner 1933). Subsequently in 1952 the author published the following in nomenclature: "*Myzus* (Syn. *Trilobaphis* and *Galobium langei* C. B. 1933)" (Börner 1952, p. 131.)

References

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1952. Europae centralis Aphides di Blattläuse Mitteleuropas Namen, Synonyme, Wirtspflanzen, Generationszyklen. Weimar Druck-und-Verlagsanstalt Gebr. Knabe K. G. Weimar. p. 131.

NEW NORTH AMERICAN TABANIDAE (DIPTERA). PART IV. ZOPHINA NEW GENUS FOR "APATOLESTES" EISENI TOWNSEND FROM LOWER CALIFORNIA[1]

CORNELIUS B. PHILIP[2]

Townsend (1895) described "Apatolestes (or nov. gen.) *eiseni* n.sp." from San Jose de Cabo, Lower California, based on a "wholly blackish" male specimen with peculiar antennae, and stated "it is entirely different from *Chrysops* in its antennal structure, and can hardly be either a *Silvius* or an *Apatolestes*." He deferred setting up a new genus, however, on the male alone. This type was destroyed in the 1906 earthquake in San Francisco[3], but J. M. Aldrich had examined it in October 1905, making a rough drawing of the antennae showing the scape longer than tall, and noting only in addition in correspondence with J. S. Hine that the ocelli were large and on a high prominence. Also in correspondence with Hine on July 6, 1907, Townsend forwarded on unpublished manuscript he had prepared on "*Zophotabanus* n. genus" in reference to this dark fly, based on two additional topotypic males and a female, the latter, unfortunately, not in good preservation. It seems doubtful if any of these additional specimens were lost with the type since Aldrich saw only the type at the California Academy of Sciences a few months previous to the great fire. None was indicated as being forwarded with the manuscript to Hine. Among Townsend material in the British Museum, there remains one badly pest-damaged male labelled, "San Jose del Cabo, L. Calif. Sept." and "Melanophlebys n.gen. eiseni Twns. types" apparently in Townsend's own handwriting. This specimen was loaned to the writer through courtesy of Mr. H. Oldroyd. It seems obvious that the other pair was destroyed by pests before this was sent to the British Museum. Heavy reliance must therefore be placed on published and unpublished notes to place this species for catalog purposes pending capture of more satisfactory specimens. There is no greater prospect that additional specimens will turn up in the near future than have in the previous intervening years, and present

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[1] From the Federal Security Agency, Public Health Service, National Institutes of Health, National Microbiological Institute.

[2] Principal Medical Entomologist, Rocky Mountain Laboratory, Hamilton, Montana.

[3] Van Dyke (Entomological News, 17(6):222. 1906) mentioned the types of Coleoptera, Hemiptera and Hymenoptera as having been saved. E. S. Ross advises that the Odonata types, then on loan, have been returned and are extant.

comments are offered to clarify the status of this long-questioned name. The Hine correspondence has been furnished through generosity of Mr. Edward S. Thomas of the Ohio State Museum.

In some respects, Townsend's notes describe specimens related to *Veprius presbiter* Rond. of Chile, but the three species of *Veprius* all have *Tabanus*-like antennal plates with dorsal angles, and the differentiation of eye facets in the males is not marked as in "*A.*" *eiseni.* Furthermore, there are minute, scattering, ocular hairs in the former, none in what remains of the "*A.*" *eiseni* specimen; the face is much more sunken between the swollen cheeks in the latter, while the palpi are as long as the proboscis. If the female has a denuded subcallus (described as a "transverse callosity") and a probable "longitudinal callosity" on the front, considering other described characters, this species does appear distinct on a generic level as discussed below. Since it is a pangoniine, a variant of Townsend's original manuscript name is adopted here, namely, *Zophina,* n. gen. (it is impossible to find an unawkward patronymic with five genera already named after Townsend). His additional unpublished notes follow:

"Head very short conical in profile, more or less flattened in appearance across the eyes; ♀ front about one-half as wide as either eye, narrowed toward vertex; ♂ eyes contiguous for a long distance, from near base of antennae to ocellar tubercle. Ocelli present. Proboscis short. Eyes bare. Difference in size of facets in ♂ eyes very marked, abrupt, not gradual, the small facets being limited to less than lower verticle one-third of eye. Front of ♀ with a transverse callosity next base of antennae, divided longitudinally by a median furrow and defined above (posteriorly) by a deep transverse furrow. There is probably also a longitudinal callosity between the transverse one and the ocelli, but it is not distinct in this specimen which is poorly preserved. Face short, antennae springing from a little below the anterior angle of eyes. Antennae not stout, rather small, more slender in the ♂ than in the ♀. First joint not elongate, but little if any longer than wide; second joint hardly one-half as long as first in ♀, in ♂ appearing but little shorter than first; third joint composed of five annuli, the basal one swollen and bead-like in ♂, less distinctly bead-like in ♀, as thick as first and second antennal joints; remaining annuli abruptly slender in ♂, slightly stouter in ♀ and tapering more gradually from basal annulus. Third antennal joint in ♀ but little longer than first and second taken together, in ♂ considerably longer. Hind tibiae with two spurs. Femora and tibiae not thickened, moderately slender in ♂, a little heavier in ♀, the front tibiae of ♀ slightly bowed. Wings normal, with none of the posterior cells narrowed or closed, longer than abdomen. Type, *Apatolestes eiseni* Towns.

"["*Zophotabanus*"] *eiseni* Towns. Proc. Cal. Acad. Sci. Ser. 2, Vol. IV, p. 596, No. 9 *(Apatolestes* or nov. gen.).

"San Jose del Cabo. One ♀, and two ♂♂, Sept. These three additional specimens enable me [Townsend] to properly characterize the form as a new genus. It is very distinct from the previously known genera. The ♀ measures full 10 mm. in length; wing 9 mm. The ♂, 7 to 8 mm. The whole insect has a blackish appearance, even including the halters and wings, though the color of the body and head is dark brownish. The front, face, and antennae are dilute brownish, more dilute in the ♂'s; the tip of anulate portion of antenna is black."

Townsend's failure to publish this manuscript is probably explained by his statement written to Hine that he intended henceforth to concentrate on the higher Diptera.

A dermestid larva (molted skin still present) has destroyed the entire abdomen, one side of the thorax with one wing missing, parts of one eye and one antenna of the British Museum specimen. A little damage along the dorsum of the plate and 3 annuli of the other antenna has occurred but all segments are present. The following additional but limited description can be made. The basal plate of the third segment, though "bead-like" in profile, is laterally compressed and not as thick as the pedicel and scape. The last is a little longer than thick, not produced above, with sparse black hairs; pedicel as tall but about two-thirds as long; plate subequal to the scape in length but more compressed laterally, and the four terminal annuli nearly twice as long as the plate and constricted abruptly not tapering from their juncture. The frontal triangle is restricted due to the extensive eye area, and is bare and shining brownish, not swollen or much raised above the eye level in profile in contrast to *Veprius*. The face to and including the oral margins unusually depressed somewhat as in *Apatolestes*, the cheeks in consequence appearing much swollen throughout their length. The palpi are slender, a little longer than the proboscis, very shaggy brown-haired almost concealing the apparently attenuated apices, unlike the truncated condition seen in most *Apatolestes*. The labellae are small and fleshy. Brief relaxing appeared to revive *Silvius*-like, irregular maculations on the undamaged part of the one eye. The subepaulet of the wing is bare and there is a short spur present at the fork of R_{4+5}. The legs are all intact, with no pale hairs and no accentuated hind tibial fringe. The outer fore tarsal claw is a little longer than the inner.

The specimen is too badly damaged to warrant its establishment as a lectotype. Since the original description was based on

the male, a future female could not be used for this purpose though it will undoubtedly be the better for more accurate, ultimate determination of relationships of this species.

In some respects *Z. eiseni* is intermediate between *Apatolestes* and *Silvius*. The writer was inclined to place the published species as a sub-genus under *Silvius*. Study of this specimen even though damaged enables corroboration of Townsend's earlier opinion that it is distinct on a generic level.

SUMMARY

Zophina new genus is proposed for *Apatolestes* (?) *eiseni* Townsend, genotype species from Lower California. Comment is made on Townsend's published and unpublished notes on this species.

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MIROLEPISMA DESERTICOLA SILVESTRI, A MYRMECOPHILE FROM CALIFORNIA

(Thysanura: Lepismatidae)

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Mirolepisma deserticola was described by Silvestri in 1938 from a single specimen collected in Tucson, Arizona in 1908. Since that time, no mention has been made of its biology or of its occurrence in California. Mallis (1941), however, did mention that he had observed Thysanura running in and out of the nest of the harvester ant, *Pogonomyrmex barbatus* var. *nigrescens*, near Riverside, California. He evidently did not collect or attempt to identify the species of Thysanura.

In 1950 W. F. Barr, now of the University of Idaho, while collecting beetles in the vicinity of Winnemucca, Nevada, found two female *Mirolepisma* in the nest of harvester ants. This discovery led the writer to search the desert areas of California and Nevada

[1] All species of ants were identified by M. R. Smith of the United States National Museum.

for additional material. The locality records of *M. deserticola* and the ants[1] with which it was found are listed below:

POGONOMYRMEX OCCIDENTALIS OCCIDENTALIS (Cresson)

NEVADA: Winnemucca, 26 April 1950 (W. F. Barr), 2 ♀ ♀.

POGONOMYRMEX CALIFORNICUS ESTEBANIUS (Pergande)

CALIFORNIA: 6 mi. W. of Indio, Riverside County, 5 April 1951 (J. W. MacSwain), 2 ♂♂, 5 ♀ ♀; Palm Springs Station, Riverside County, 20 April 1951 (W. J. Wall, R. C. Bechtel, E. I. Schlinger and E. J. Taylor), ♂♂, ♀ ♀; Sheep Hole Mts. (summit), San Bernardino County, 30 March 1952 (R. C. B. and E. I. S.), ♂♂, ♀♀; Bagdad, San Bernardino County, 30 March 1952 (R. C. B. and E. I. S.) ♂♂, ♀♀.

POGONOMYRMEX CALIFORNICUS (Buckley), s. lat.

CALIFORNIA: Whitewater, Riverside County, 28 March 1952 (R. C. B. and E. I. S.), ♂♂, ♀ ♀.

MYRMECOCYSTUS SEMIRUFA (Emery)

CALIFORNIA: 6 mi. W. of Indio, Riverside County, 5 April 1951 (J. W. MacSwain), 1 ♀.

VEROMESSOR PERGANDEI (Mayr)

CALIFORNIA: Palm Springs, Riverside County, 21 April 1951 (W. J. W. and R. C. B.), 1 ♂, 1 ♀; Whitewater, Riverside County, 28 March 1952 (R. C. B. and E. I. S.), ♂♂, ♀ ♀; Bagdad, San Bernardino County, 30 March 1952 (R. C. B. and E. I. S.), ♂♂, ♀ ♀; 29 Palms, San Bernardino County, 30 March 1952 (R. C. B. and E. I. S.), ♂♂, ♀ ♀; Sheep Hole Mts. (summit), San Bernardino County, 30 March 1952 (R. C. B. and E. I. S.), ♂♂, ♀ ♀; Rand, Kern County, 31 March 1952 (R. C. B. and E. I. S.), ♂♂, ♀ ♀[2].

SOLENOPSIS sp.

CALIFORNIA: Cabazon, Riverside County, 20 April 1951 (W. J. W. and R. C. B.), 1 ♀[3]. Magnesia Canyon, Riverside County, 21 April 1951 (W. J. W. and E. I. S.), 1 ♀.

MISCELLANEOUS RECORDS

CALIFORNIA: N.W. of Barstow, San Bernardino County, October 1928; Salton Sea Beach, Imperial County, 22 April 1951 (W. J. W. and R. C. B.), 1 ♂, 1 ♀ (ants not identified); 1 mi. S. of Desert Beach, Imperial County, 10 April 1952 (W. H. Lange), 1 ♀ [with *Thermobia domestica* (Packard)].

The species of ants with which *Mirolepisma* was found are in general desert forms. According to Creighton (1950) and Mallis (1941) *P. occidentalis*, *P. californicus*, and *P. californicus estebanius* are found in the desert areas of Arizona and Southern California. The range of *P. occidentalis* extends northward into Nevada and eastward to New Mexico, while *P. californicus* is also found in Texas and Mexico.

M. deserticola is well adapted to life in sandy areas. Its legs are armed with stout spines and when individuals are exposed to the

[2] Crickets of the genus **Myrmecophila** were also found in this nest of ants.

[3] Several **Reticulitermes hesperus** Banks were also present.

light, they will dig rapidly until completely buried. The exact relationship between the ants and silverfish has not been definitely established, but it was noted that the *Mirolepisma* carefully avoided contact with the ants. This observation led the writer to conclude that a commesal relationship exists between the two groups.

In order to ascertain the food habits of *M. deserticola,* a number of silverfish were taken alive and reared in a controlled temperature cabinet in the laboratory at Davis. The temperature employed was 25 degrees C. ± 1 and the relative humidity was 75 percent ± 3. No water was given directly to the insects; the food was dry whole wheat flour. Over a period of 14 months, the culture thrived and hundreds of ova and nymphs were produced from the original group of some 40 adults.

Since no detrimental results were incurred when the silverfish were separated from their hosts, it is believed that *M. deserticola* obtains its food from the products stored by the ants rather than any secretion or regurgitated fluid from the body of the ants.

According to Creighton (1950), Mallis (1941) and Wheeler (1926), *Pogonomyrmex occidentalis, P. californicus, P. californicus estebanius, Veromessor pergandei,* and some species of *Solenopsis* are seed collectors. The feeding habits of *Myrmecocystus semirufa* appear to be uncertain. Creighton (1950) claims that repletes are used to store honey, but that the bodies of other insects are also collected and stored. Mallis (1941) showed that in one instance in Southern California this species attended aphis, apparently for secretions of honey dew.

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A NEW INTERTIDAL FLY FROM CALIFORNIA, WITH NOTES ON THE GENUS NOCTICANACE MALLOCH

(Diptera: Canaceidae)

WILLIS W. WIRTH[1]

Since the publication of my revision of the family Canaceidae (Wirth, 1951), I have received some additional material, including a fine series representing an undescribed species of *Nocticanace* Malloch. A description of the new species is presented here, the status of *Nocticanace* is clarified, and some new American distribution records for this genus are added.

Genus NOCTICANACE Malloch

Nocticanace Malloch, 1933, B. P. Bishop Mus. Bull., 114:4; Wirth, 1951, Occas. Papers B. P. Bishop Mus., 20:269; Wheeler, 1952, Ent. News, 63:91.

Because Malloch's paper, as stated in a footnote, was issued as Pacific Entomological Survey Publication 7 on Febraury 27, 1933, *Nocticanace* should date from 1933, and not from 1935, the date when the complete volume of Bulletin 114 was assembled. Neave's Nomenclator Zoologicus and the Zoological Record both erroneously give the date as 1935 and the citation given in my paper was not clear. Most of this information has been correctly cited by Wheeler (1952), who is of the opinion that *Nocticanace* is very likely the same as *Canaceoides* Cresson, 1934, in which case Malloch's name has priority.

As suggested by Wheeler, the characters separating *Canaceoides* and *Nocticanace* do not seem to be very strong, and the new species here described brings the two groups closer together. One cannot very well merge these two genera, however, without considering also the close ties which I have already pointed out (1951, p. 264) between *Canaceoides* and *Canace* exhibited through *Canace maritima* Wirth. Until more species are known, I believe it most practical to retain the narrower generic concepts and in the following discussion I will point out a combination of characters suitable for the differentiation of *Canaceoides* and *Nocticanace*. In any event, the ensuing new combinations will have to be made, in view of the priority of *Nocticanace*.

Nocticanace arnaudi Wirth, new species

(Figure 1, a)

Male, female: Body length of male about 3 mm., of female 3.5 mm.;

[1] Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, U. S. Department of Agriculture.

wing 3.7 mm. by 1.4 mm. Color opaque black, dorsum black tinged with brownish; antennae and palpi brownish black; face and cheeks pruinose, pearly gray when viewed from above, brownish from below; humeri, pleura, legs and abdomen dark brown, with pruinose gray lights; wings and squamae opaque brownish with dark veins; halteres whitish.

Frons broader than long, flat in front over eyes, ocellar prominence well-developed, brownish in color, with 10–15 fine hairs. Three strong fronto-orbitals, the intervening hairs long and fine; one pair of strong proclinate interfrontals; ocellars strong; inner and outer verticals strong; postverticals absent. Face bare, median carina strong between antennae. Cheeks each with three strong bristles, the inner one directed mesad, the outer two upcurved, with a small hair about half as long out of line below the lateral pair by half the distance between their bases. Third antennal segment slightly broader than long; arista short pubescent. Palpus with 1–4 apical hairs.

Thorax on each side with four strong dorsocentrals, one strong humeral, a strong posterior notopleural and an anterior one half as long, one strong presutural, two strong supra-alars; humeri and anterior margin of mesonotum except between dorsocentral lines with strong, erect setae, rest of mesonotum bare. Scutellum with four strong marginals, the disc bare. Mesopleura with numerous, scattered, long hairs and setae, sternopleura each with a long fine hair and a few scattered setae. Legs with numerous, stout, curved hairs, these short except the posteroventral series on fore femora; tarsi with distal segments markedly flattened.

Abdomen with scattered, long erect hairs. Eighth tergite of female with two, long, lateral hairs reaching apices of genital lamellae and four or five fine hairs about half as long between; eighth sternite also with a few long, fine hairs; dorsal lamellae of opipositor stout, upcurved, each with two stout, black, apical spines and about three smaller, brownish, preapical ones on dorsal side. Ninth tergite of male (fig. 1, a) with the ventral processes each broadly attached at base, ventral margin with numerous fine hairs, apex prolonged in a slender, straight, fingerlike, external lobe bearing only microscopic setulae; a shorter, broader, inner lobe present on the dorsal margin of the ventral processes hidden by the subapical, dorsal angle and bearing numerous, stout, ventromesally projecting spines.

Holotype ♂, *allotype*, POINT LOBOS, MONTEREY COUNTY, CALIFORNIA, February 4, 1948, W. Wirth (on intertidal rocks) (type No. 61608, U.S.N.M.). *Paratypes:* 3♂♂, 4♀♀, same data as types (in U.S.N.M.); 1♂, Laguna, Orange County, California, August 1, 1932, J. M. Aldrich (U.S.N.M.); 8♂♂, 8♀♀, beach south of Pescadero, San Mateo County, California, December 15, 1951, P. H. Arnaud, Jr. (5 in U.S.N.M., 3 deposited in California Academy of Sciences, San Francisco, and 8 returned to Mr. Arnaud).

About the only characters by which this species differs from *Canaceoides nudata*, the genotype of *Canaceoides* Cresson, are the presence of the very fine secondary hair ventrally out of line on the cheeks rather than a fourth, equally strong and aligned genal

bristle; the disc of the scutellum bare rather than with a pair of small bristles; the eighth tergite of the female with two long hairs in the marginal row reaching the apices of the ovipositor lamellae rather than with a row of small subequal hairs and in the structure of the male genitalia (compare figure 1, a, with figure 5, c, of *nudata* in Wirth, 1951). These are actually the only characters which can be relied on to separate the genera *Nocticanace* and *Canaceoides*. I believe that for generic separation, emphasis should be placed on these characters, rather than on the condition of the anterior notopleural, which is absent in most species of *Nocticanace*, weak in *Canaceoides* and in *N. arnaudi* and strong in *N. chilensis* (Cresson).

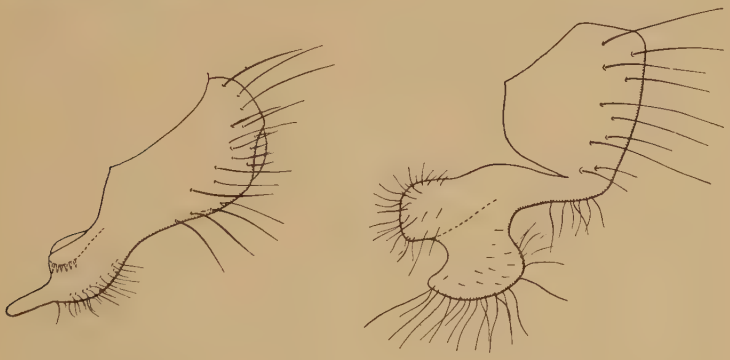

Figure 1. Male genitalia of *Nocticanace*, lateral views of ninth tergite. a, *N. arnaudi*, n. sp.; b., *N. texensis* (Wheeler).

NOCTICANACE CHILENSIS (Cresson), new combination

Canace chilensis Cresson, 1931, Dipt. Patagonia and S. Chile, 6:116.
Canaceoides chilensis, Cresson, 1934, Trans. Amer. Ent. Soc., 60:221; Wirth, 1951, Occas. Papers B. P. Bishop Mus., 20:269.

New record: Panama, Canal Zone, February 10, 1939, C. H. Richardson, 1♂.

This is the first record of *N. chilensis* from outside of Chile. This species belongs in *Nocticanace* rather than *Canaceoides* because of the absence of hairs on the disc of the scutellum, the presence of two elongate hairs on the eigth tergite of the female and the presence of small secondary hairs between and below the long genal bristles. Since there are from three to six strong genals

in *chilensis*, I believe that the presence of the smaller, secondary hairs is a better generic character than the actual number of strong genals. The presence of two equally strong notopleurals in *chilensis* limits the use of this character in generic differentiation.

NOCTICANACE TEXENSIS (Wheeler), new combination

(Figure 1, b)

Canaceoides texensis Wheeler, 1952, Ent. News 63:92 (♂ ♀, Galveston, Texas.)

New records: Boynton Beach, Palm Beach County, Florida, August 10, 1951, W. W. Wirth, 8 ♂ ♂, 8 ♀♀; Mona Island, Puerto Rico, August 6, 1939, L. F. Martorell, 1 ♀ (all in U.S.N.M.).

The Florida specimens were collected from a shelf of limestone rock about a hundred yards long on the Atlantic Ocean beach. This rock projected from the water only at low tide and was covered with a scanty growth of filamentous green algae. Through the kindness of Dr. Wheeler I have compared these specimens with a female paratype of *texensis* with which they agree well. The small, out-of-line, fourth genal, the absence of hairs on the disc of the scutellum, the absence of the anterior notopleural and the presence of the pair of long hairs on the eighth tergite of the female will place this species in *Nocticanace rather than Canaceoides*. In fact this species is practically indistinguishable from *N. peculiaris* Malloch, the genotype of *Nocticanace*, differing mainly in that the body is not quite so dark, the palpi are yellowish rather than brown and the two anterior genal bristles are more closely approximated and lack the fine seta below and between which is found in *peculiaris*. The male genitalia of *texensis*, which have not been described, have the ninth tergite (figure 1, b) with the ventral processes semidetached, each greatly expanded distally into two setose lobes, the outer or dorsolateral lobe thumblike, bearing dense, long setae except on the lateral surface; the ventromesal lobe in the form of a flattened, rounded lamella bearing dense, very long setae on the inner surface.

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OBSERVATIONS ON THE PUPAE OF BEES

(Hymenoptera: Apoidea)

CHARLES D. MICHENER[1]

In the course of a recent study of bee larvae, pupae of a number of species have come to hand. The present investigation was undertaken in order to glean whatever information could be obtained on the pupal characters and the relationships of groups.

The pupae, as is well known, exhibit essentially the shape and form of adults, and the general features of pupae have been described and illustrated by many authors (e.g. Packard, 1897). From our standpoint the important pupal features are those not repeated in the adult, since the adult characteristics are well known. Unfortunately most authors have not systematically recorded these structures which are peculiar to pupae. As a result, most published accounts of pupae are of little value from the present standpoint.

Those pupal characters which are peculiar to pupae consist principally of spines and projections arising from various parts of the body. Their functions are unknown, although in some cases it is possible to see hairs of the adult projecting into them in older pupae. This is by no means always the case, spines being present (although small) in such relatively hairless bees as *Neopasites*. Nonetheless, the original function of these projections may have been to provide space for the development of the long hairs characteristic of bees and associated with their pollen collecting habits. On broad flat areas of the body these hairs can develop in a recumbent position, but at the ends of segments where the spines are of most frequent occurence long hairs cannot well develop in this position. Thus the long spines of the coxae and trochanters serve to house the long hairs arising on these segments in some bees (fig. 1). This explanation cannot well account for the scutal tubercles of *Xylocopa* or *Melecta*, for example, but does seem to be a possible explanation of most of the pupal projections.

It is interesting that certain adult spines and projections which have arisen repeatedly among the various bee groups correspond to the pupal projections. For example, anterior coxal spines,

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[1] Contribution number 807 from the Department of Entomology, University of Kansas.

Specimens were made available through Dr. J. W. MacSwain of the University of California and Dr. Bernard Burks of the Division of Insect Identification, Bureau of Entomology and Plant Quarantine.

found in adults of at least certain species of such unrelated genera as *Colletes, Nomada, Megachile,* and *Xylocopa,* but generally absent in adult bees, are formed inside of pupal spines which are found in virtually all bees but ordinarily contain only hair. Thus it would seem that the pupal spines provide a potentiality for the development of adult spines.

Table I summarizes the characteristics peculiar to pupae of bees. The characters require explanation as follows:

1. "Scape"—When the antennal scape bears a small median tubercle, it is marked +.
2. "Vertex"—The symbol + indicates that a pair of tubercles are present on the vertex more or less in the position of the lateral ocelli.
3. "Frons"—The symbol + indicates the presence of a pair of low tubercles, one in front of the summit of each eye.
4. "Lateral angles of pronotum"—The symbol + indicates that these angles are produced to spines.
5. "Posterior lobes of pronotum"—The symbol + indicates that these lobes are produced.
6. "Mesoscutum"—The symbol + indicates that paired tubercles are present.
7. "Scutellum"—The symbol ++ indicates a pair of large erect protuberances while + indicates a pair of smaller, anteriorly directed ones. (See *Melecta,* excluded from table since specimens are not available.)
8. "Metanotum"—The symbol + indicates a median protuberance.
9. "Tegulae"—The symbol + indicates a protuberance, ++ a spine, ± a protuberance present or absent.
10. "Wings"—The symbol + indicates a small median tubercle on each forewing and usually a small basal tubercle as well.

11–13. "Coxae"—The symbol + indicates an inner apical coxal spine; ++ is used if the spine is unusually long.

14–16. "Trochanters"—The symbol + indicates a posterior apical spine; ++ is used if the spine is unusually long.

17–18. "Femora"—The symbol + indicates a posterior or inferior basal protuberance on the femur while ++ indicates a spine in this position.

19. "Hind tibiae (base)"—The symbol + indicates a protuberance near the base of each hind tibia, at about the position of the apex of the basitibial plate, while ++ indicates a spine in this position.
20. "Hind tibiae (apex)"—The symbol + indicates an outer apical spine at the apex of the hind tibia.
21. "First tergum spiculate"—The numerals indicate the anteriormost metasomal tergum to bear a transverse subapical row of spicules. Commonly spicules are found from the tergum indicated in this row back to the fifth (females) or sixth (males) tergum, but this is not universal.

22. "Size of tergal spicules"—The symbol + indicates minute spicules, giving rise to setae which are more conspicuous than the spicules; ++ indicates larger spicules, while +++ indicates very large spicules.
23. "Long setae"—The symbol + indicates long setas on vertex, mesoscutum, and metasomal terga.

	Colletes	Policana	Nomadopsis	Augochlora	Lasioglossum	Halictus	Nomia	Megachile	Xylocopa	Neopasites	Emphor	Diadasia	Anthophora	Bombus	Trigona	Apis
1. Scape				+												
2. Vertex		+		+	+	+	+	±								
3. Frons				+	±											
4. Lateral angles of pronotum	+															
5. Posterior lobes of pronotum	+	+										+	+			
6. Mesoscutum			2+						2+		4+	2+	2+			
7. Scutellum	+ +	+ +		+ +	+ +	+ +	+ +					+	+			
8. Metanotum	+	+		+	+	+	+									
9. Tegulae		+			±	+	+ +									
10. Wings				+	+	+	+									
11. Fore coxae	+ +	+ +	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+
12. Mid coxae	+ +	+ +	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+
13. Hind coxae	+ +	+ +	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+
14. Fore trochanters	+ +	+ +	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+ +
15. Mid trochanters	+ +	+ +	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+
16. Hind trochanters	+ +	+ +	+	+	+	+	+	+	+ +	+	+	+	+	+	+	+
17. Fore femora	+ +	+ +	+	+	+	+	+				+	+ +	+ +		+	+ +
18. Mid femora							+						+ +		+	+
19. Hind tibiae (base)				+ +	+ +	+	+ +									
20. Hind tibiae (apex)						+										
21. First tergum spiculate			2	1	1	1	3	2	2	2	2	2	2	2	2	
22. Size of tergal spicules			+ +	+ + +	+ + +	+ + +	+ +	+	+ +	+ +	+ +	+ +	+ +	+	+	
23. Long setae								+								

It is evident from a study of Table I that, so far as the few bee pupae available are concerned, considerable support for existing classifications (see Michener, 1944) is provided. Thus the

family Colletidae is distinguishable by the absence of tergal spicules, a character shared only with *Apis*. The family Halictidae is recognizable by the numerous and very strong protuberances, the tubercles on the wings and the spine or tubercle at the base of the hind tibiae being found only in this family. *Nomia* falls clearly with the Halictidae on the basis of pupal characters, although some authors have put it with the Andrenidae. *Megachile* differs from all other known bee pupae in the presence of long setae. It is interesting that megachilid larvae are the principal bee larvae having setose bodies. The larger anthophorine bees *(Emphor, Diadasia, Anthophora, Melecta)* are distinguished from the Apinae by the presence of mesoscutal tubercles, and in this respect they resemble *Xylocopa*.

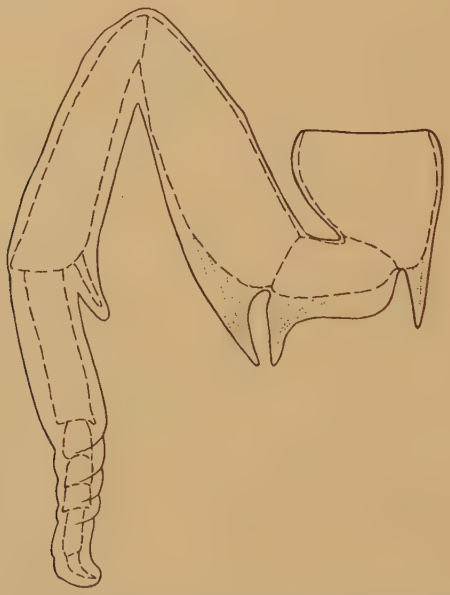

Fig. 1. Fore leg of *Anthophora linsleyi* Timberlake, pupa, showing by broken lines the developing adult leg within and by dotted lines some of the hairs inside the pupal spines.

The following descriptive comments are limited to those features of the pupa not shared by adults. For example, inner apical spines of the tibiae are not mentioned since the tibial spurs of the adults form inside of them and their position and number is re-

flected by the adult structures. Spines and other projections are absent unless stated to be present.

COLLETES FULGIDUS Swenk

Lateral angles of pronotum and posterior lobes of pronotum produced; mesoscutellum with a pair of large protuberances; metanotum with large median protuberance; coxae, trochanters, and bases of anterior femora with long spines.

Montara, California, September, 1940 (J. W. MacSwain).

POLICANA HERBSTI Friese

As described for *Colletes* but vertex with distinct pair of tubercles (in positions of lateral ocelli); lateral angles of pronotum not produced; tegulae produced; posterior margins of metasomal terga swollen.

Correo Nuñoa, Chile (Claude-Joseph).

NOMADOPSIS EUPHORBIAE (Cockerell)

Mesoscutum with pair of very small tubercles, one on either side of midline, in front of middle; coxae and trochanters with spines; bases of fore femora each with inferior projection; metasomal terga, beginning with the second, with subapical rows of spicules, the rows interrupted medially.

Riverside County, California, August 17, 1946 (J. W. MacSwain).

AUGOCHLORA PURA (Say)

Vertex with pair of protuberances (in positions of lateral ocelli) and pair of lower ones just in front of upper ends of eyes; antennal scapes each with small protuberance; scutellum with pair of high protuberances; metanotum with median broad protuberance; middle of each forewing with protuberance; smaller one at base of each wing; coxae and trochanters each with small spine; bases of fore femora each with protuberance; base of hind tibia with short spine; metasomal terga with large subapical spicules, only a few on first tergum and these unusually large.

Short Mountain, Shenandoah, Virginia, June 6, 1941, in rotten log (A. B. Gurney).

LASIOGLOSSUM (CHLORALICTUS) SPARSUM (Robertson)

As *Augochlora pura* but pair of protuberances in front of upper ends of eyes and on antennal scapes absent; tegulae somewhat protuberant.

Lawrence, Kansas, June 24, 1951 (C. D. Michener).

LASIOGLOSSUM (EVYLAEUS) KINCAIDII (Cockerell)

As *Augochlora pura* but small protuberances on antennal scapes absent; spicules of first metasomal tergum like those of second.

Montara, California, June 12, 1940 (J. W. MacSwain).

HALICTUS TRIPARTITUS Cockerell

As in *Augochlora pura* but pair of protuberances in front of upper ends of eyes and on antennal scapes absent; tegulae somewhat protuberant; basal spine of each rear tibia a mere protuberance but apex of rear tibia with long spine on outer side (in addition to usual tibial spurs on inner side); spicules of first tergum similar to those of second.

Chino, Arizona, July 4, 1950 (J. G. Rozen, R. H. Beamer).

NOMIA MELANDRI Cockerell

Vertex with pair of small tubercles (in positions of lateral ocelli); scutellum with pair of high tubercles; metanotum with median projection; tegulae each with sharp spine; forewing with weak median and basal projection; coxae and trochanters with spines, those of former rather short, especially on rear coxae; fore and middle femora with protuberances at bases; base of hind tibia with spine; metasomal tergum three and following with subapical spicules.

Delta, Utah, June 27, 1950 (G. E. Bohart, C. D. Michener).

MEGACHILE (CHELOSTOMOIDES) sp.?

Coxae and trochanters with spines; metasomal sterna produced apically (female); vertex and median region of mesoscutum with long setae; metasomal terga two and following with subapical rows of long setae.

Blythe, California, April 2, 1941, in old *Colletes* burrow (E. G. Linsley, J. W. MacSwain).

MEGACHILE (LITOMEGACHILE) BREVIS Say

As in the species of *Chelostomoides* but vertex with three small tubercles representing positions of ocelli.

Lawrence, Kansas (C. D. Michener).

XYLOCOPA VIRGINICA (Linnaeus)

Mesoscutum with a pair of tubercles in front of middle, one on each side of midline; coxae and trochanters with long spines; metasomal terga two and following with small subapical tubercles; last tergum produced to a hard spine.

Veitch, Virginia, July 7, 1914 (T. E. Snyder).

NEOPASITES sp.?

Coxae and trochanters with small spines; metasomal terga two and following with subapical rows of spicules.

The specimen is in poor condition and there may be more pupal structures than indicated.

Lawrence, Kansas, April 5, 1951, from nest of *Calliopsis andreniformis* Smith (C. D. Michener).

EMPHOR BOMBIFORMIS (Cresson)

Mesoscutum with two pairs of tubercles, the anterior pair in front of middle, the posterior pair behind middle, the latter closer together than the former; scutellum swollen; coxae and trochanters with spines, anterior femora each with basal projection; metasomal terga two and following with subapical spicules.

Hattiesburg, Mississippi, August 20, 1944 (C. D. Michener).

DIADASIA ENEVATA (Cresson)

Posterior lobes of pronotum produced; mesoscutum with a pair of tubercules behind middle; scutellum with two tubercles, large and directed forward; coxae and trochanters with spines, those of rear trochanters short; anterior femora each with spine at base; metasomal terga two and following with subapical rows of spicules.

Delta, Utah, June 27, 1950 (G. E. Bohart, C. D. Michener).

ANTHOPHORA LINSLEYI Timberlake

Posterior lobes of pronotum produced to spines; mesoscutum with a pair of tubercules behind middle; scutellum with a pair of anteriorly directed tubercles; coxae and trochanters each with a spine; bases of fore and middle femora each with a long spine; metasomal terga two and following with subapical rows of spicules.

Twenty miles east of Bakersfield, California, March 29, 1941 (E. G. Linsley, J. W. MacSwain).

ANTHOPHORA (CLISODON) FURCATA SYRINGAE (Cockerell)

As above, but no long spine at base of middle femur.

Mineral King, Tulare County, California, August 10, 1939 (G. E. Bohart).

MELECTA spp.

Semichon (1922) has described the pupa of *Melecta armata* Panzer. It is said to be similar to that of its host, *Anthophora personata* Erickson, except that the pair of mesoscutal tubercles are erect, each forming a multidentate crest, and the scutellar tubercles are much larger and directed posteriorly to form spines. The mesoscutal tubercles are shown to be similarly modified in *Melecta miranda* Fox by Porter (1951).

BOMBUS AMERICANORUM (Fabricius)

Coxae and trochanters with apical spines; metasomal terga two and following each with subapical row of short setae.

Lawrence, Kansas, August, 1950 (C. D. Michener).

BOMBUS VOSNESENSKII Radoszkowski

Agrees with *B. americanorum*.

Hat Creek, Lassen County, California, June 4, 1941 (E. G. Linsley, C. D. Michener).

TRIGONA CUPIRA Smith

Coxae and trochanters with spines, those of fore and hind coxae very short; fore and middle femora each with projection at base; metasomal terga two and following with subapical rows of setae.

Juan Mina, Canal Zone, May 4, 1945 (C. D. Michener).

APIS MELLIFERA Linnaeus

Coxae and trochanters with spines, those of front coxae short, of front trochanters unusually long; fore femora each with a spine at base, middle femora with a blunt projection, hind femora with a broad rounded projection.

Lawrence, Kansas, June 1, 1952 (M. H. Michener).

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A NEW SPECIES OF DOBSONFLY FROM CALIFORNIA

(Megaloptera: Corydalidae)

DONALD E. MADDUX

Chico State College, Chico, California

During a recent investigation, a number of immature forms of some dobsonflies of the genus *Protochauliodes* were reared, and a new species was noted. It is most closely related to *Protochauliodes minimus* (Davis) but differs noticeably in the structure of the terminalia.

Protochauliodes aridus Maddux, n.sp.

Male: General body color closely resembling that of *Protochauliodes minimus. Head* triangular, widest across eyes, tapering caudad to its nar-

rowest width at point of attachment to thorax; tuft of long hairs on lateral border of head, just posterior to each eye. Antennae dark brown, simple, filiform, approximately the same length as the body; antennal segments twice as long as broad and bearing short bristles closely appressed to the margin of the segments to which they are attached. Mouthparts rufous, apex of distal point of incisor of mandible usually not extending below proximal end of mandible. *Prothorax* longer than wide, the sides nearly parallel, mesothorax and metathorax broader than long. Wings hyaline and cinerous, with a conspicuous, transverse, fuscous blotch surrounding the medio-cubital cross-vein; other such blotches are scattered over the wing surfaces, especially in the costal and subcostal cells of the fore wings. Blotches fewer on the hind wing and confined almost entirely to an area along the costal margin. Hind wing with a small, round, fuscous mark, just proximad to each of the two inner radio-medial cross-veins. Fore wing slightly longer than the hind wing, but both essentially alike in venation, the venation agreeing with that of other members of the genus and being very much the same as that of *Protochauliodes minimus*. *Aedeagus* wide at base, narrowing to half the width at the apex; apex notched. Base of gonopod with dorso-medial side enlarged into a conspicuous tuberosity. Apex of gonopod half the height of the base. Body length 16 mm.; alar expanse 57 mm.

Female: Much larger than male. Body length 21 mm.; alar expanse 82 mm. Antennae approximately the length of the body; antennal segments rectangular, lightly pilose.

Holotype, male, reared by the author from a larva taken in a dry stream bed near the Neal Road, seven miles southeast of CHICO, BUTTE COUNTY, CALIFORNIA, May 15, 1951. The *allotype* was reared from a larva taken at the same locality, May 10, 1951. Two *paratypes* were reared from larvae collected at the same locality, one on May 8, 1951, the other on May 9, 1951; both are males. Holotype and allotype are in the museum of the California Academy of Sciences, San Francisco. Paratypes are in the collection at Chico State College.

The larval and pupal forms from which the above specimens were reared were taken in streams which have water for only a few days in the winter. They were found under rocks in cells fashioned to prevent the drying of the specimen. Eggs were collected in the field and were also obtained from specimens reared in the laboratory. The egg masses are rectangular in outline; the eggs are arranged in a series of parallel rows, about 3,000 in a large bunch. The micropylar ends all face in the same direction. The eggs are deposited in June, hatch in about a week, and the very small larvae burrow into the dry soil near the larger rocks. Pupation occurs in March, April, and May. The adults hatch in May and June.

A REDESCRIBED SPECIES AND A NEW GENUS AND SPECIES OF THE FAMILY LEPISMATIDAE IN CALIFORNIA

(Thysanura)

WILLIAM J. WALL JR.
University of California, Davis

Very little information is available on the species of this family in California. In 1896 a new species *(Lepisma rubro-violacea)* from Mexico, Arizona and California, was described by Schött. He failed to realize the importance of certain structures and did not include these in his description. However, his figures were excellent and accurately identified this species. The specimens examined by Schött were evidently lost in the San Francisco earthquake and fire of 1906, and no mention of this form has appeared in the literature since 1905.

In 1950, W. F. Barr of the University of California, collected one specimen from the desert near Borego Valley. Since this time, numerous specimens have been found in the Colorado Desert beneath stones, boards and cardboard cartons.

CTENOLEPISMA RUBRO-VIOLACEA (Schött)

Lepisma rubro-violacea (Schött, 1896. Proc. Calif. Acad. Sci., (2)6:190–192, pl. 18, figs. 45–51.

Ctenolepisma rubro-violacea Escherich, 1905. Zoologica, orig.-ab. 18 (heft 43) 95–96, fig. 39.

Redescription. Female. Length: body 10.2 mm.; antenna 10.4 mm.; cercus 10mm.; median caudal filament 11.20 mm.; ovipositor as seen from below, projecting 2 mm. from segment IX. Width: at eyes 1.6 mm.; mesothorax 2.8 mm.; Xth abdominal segment 1.6 mm.; ovipositor .2 mm. Body elongate, tapering gradually posteriorly.

Head color reddish particularly the frontal and lateral areas; thorax white with exception of prothoracic acrotergite which has strong reddish pigmentation reaching almost to center; abdomen reddish with inverted "v shaped" white areas; pigmentation becoming darker towards posterior. Scales of dorsum reddish brown with white scales surrounding each setal tuft on thorax and abdomen; ventral scales white; setae of entire body golden; legs white, pigmented with red; setal tufts on head prominent.

Labial palpus four segmented, pigmented with red; distal segment hatchet shaped with five sensory papillae arranged in a single row along anterior margin; maxillary palpus five segmented, pigmented with red.

Prothoracic sternite with five pair of setal tufts; mesothoracic sternites with two pair of setal tufts; metathoracic sternite with one pair of setal tufts.

Tergite X widely triangular and weakly rounded at tip, wider than long. Outer dorsal setal combs (lateral) on abdominal tergites I-VIII; abdominal tergites II-VII with 3+3 setal combs (i.e. one lateral, one subdorsal and one

dorsal); tergite I with 1+1 (2 inner pair lacking); tergite VIII with 2+2 (central pair lacking); IX with none; X with 1+1. Only one pair of setal combs on ventral sternites III through VII. Three pairs of reddish pigmented styli present on gonocoxites VII, VIII and IX, posterior pair longest. Cerci and median caudal filament reddish alternating with white, annulated; antennae same.

Male: similar to female except for differences in genitalia; gonocoxites of segment IX long and narrow in female, short and stout in male.

Discussion. *C. rubro-violacea* and *C. lineata* (Fabricius) are very similar in appearance when the scales are removed. However, the clypeus of *C. lineata* is strongly pigmented on the lateral aspect where the setal tufts are located and in the center; in *C. rubro-violacea* the pigmentation is faint or lacking. Also the lateral aspect of the area around the setal tufts of the labrum may be faintly pigmented in *C. lineata* and not in *C. rubro-violacea*. Further, the prothoracic acrotergite is pigmented only on the lateral aspects in *C. lineata*, while on *C. rubro-violacea*, the pigmentation extends throughout except for a thin median band.

The number of setal tufts on each side of the prosternal plate in *C. rubro-violacea* may vary from 4 to 5. The remaining characteristics appear to be constant.

The description of the neotype female given above was made from a single specimen now preserved in alcohol. However, the concept of this species is based on 8 females and 11 males which were studied alive by the writer and later in alcohol. Some of the original members of this series were dissected and used for study of the internal anatomy and in part have been mounted on slides in the possession of the writer. The remaining complete specimens, consisting of the neotype ♀ and 5 neoparatypes (2♂♂ and 3 ♀♀) have been deposited at the California Academy of Sciences, San Francisco, California.

Distribution. Schött gave the following localities: Sierra Laguna, San Jose del Cabo, Baja California; Guaymas and San Miguel de Horcasitas, Sonora Mexico; Tucson, Arizona (coll. B. Eisen). In addition, he stated that this species is "richly represented in California collections and seems to be very common."

Neotype locality. California: Cabazon, Riverside Co.

Material examined. Borego Junction, San Diego Co., 9 April 1950 (W. F. Barr); Cabazon, Riverside Co., 20 April 1951 (W. J. Wall, R. C. Bechtel, E. I. Schlinger and E. J. Taylor); Salton Sea Beach, Imperial Co., 21 April 1951 (W. J. W. and R. C. B.); 2 mi.

E. of "The Narrows", San Diego Co., 23 April 1951 (R. C. B.); Whitewater, Riverside Co., 28 March 1952 (R. C. B. and E. I. S.).

While collecting in the Colorado Desert near Cathedral City, the writer and E. I. Schlinger of the University of California discovered a new thysanuran beneath a large stone. Several other specimens were later taken at other localities and in two instances with *C. rubro-violacea*. The favored habitat of this new species appears to be beneath stones, boards and other places of concealment in desert areas.

Leucolepisma new genus

(Figures 1–9)

Description. Body elongate, slender, thorax wider than abdomen tapering weakly posteriorly. Head with numerous setal tufts, those arranged postero-mesad and anterio-mesad to the antennae, are large and very obvious; thoracic nota broad, each bearing a pair of setal combs on the postero-dorsal margin; lateral margins with setal tufts and individual setae; legs long, tarsal claws very long, claws of prothoracic leg at least one and one third times the second tarsal segment; three pair of dorsal abdominal setal combs on tergites II-VII; lateral setal combs on several sternites and one pair of median setal combs on several segments; ovipositor short, stout and tip armed with short, stout blunt spines.

Type of the genus: *Leucolepisma arenaria* Wall, new species.

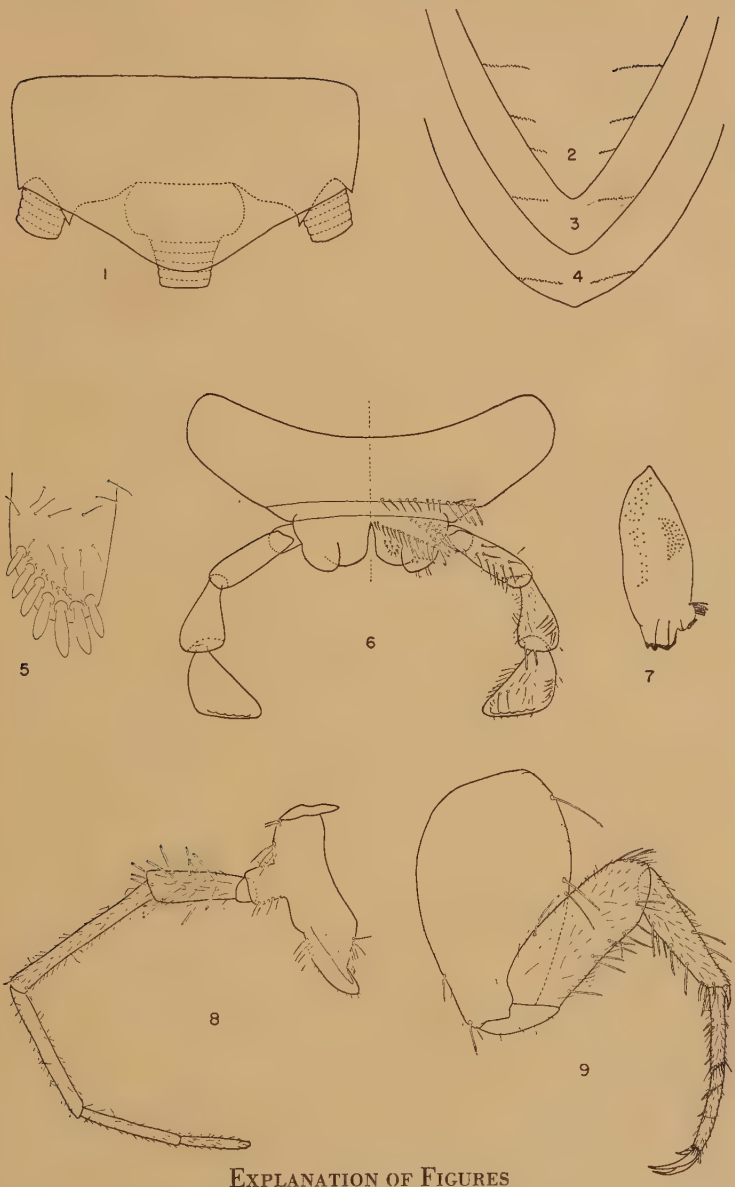
This genus is similar in general to *Thermobia* but differs in having three rows of dorsal setal combs on the lateral aspect of the abdominal tergites, instead of two; by the length of the tarsal claws, and by the short ovipositor terminating in short blunt spines.

Leucolepisma arenaria new species

(Figures 1–9)

Female. Length: body 8.16 mm.; antenna 11.60 mm.; cercus 8.16 mm.; median caudal filament 9.60 mm.; ovipositor as seen from below not extending beyond gonocoxites of segment IX. Width: at eyes 1.44 mm.; mesothorax 2.25 mm.; Xth abdominal segment 1.22 mm. Head and body color white; dorsal surface with brown and yellowish white scales forming a distinct pattern; scales of head brown; those of the thorax with alternating irregular cross bands of brown and yellowish white; those of abdomen with alternating patches of brown and yellowish white on each segment; when freshly molted, much darker; ventral surface with white scales; setal tufts of head golden. Legs white with light reddish setae and faint reddish pigmentation on tibia and 1st tarsal segment; cercus and median caudal filament reddish with light segments at intervals; antenna same.

Setal tufs of head prominent. Labial palpus four segmented, distal segment hatchet shaped, shorter than the penultimate one and bearing five large



Explanation of Figures

Leucolepisma arenaria, n.g., n.sp. Fig. 1 Abdominal tergite X. Fig. 2. Prothoracic sternite. Fig. 3. Mesothoracic sternite. Fig. 4. Metathoracic sternite. Fig. 5. Terminus of outer ovipositor valve showing digging spines. Fig. 6. Labium. Fig. 7. Left mandible. Fig. 8. Right maxilla. Fig. 9. Right prothoracic leg (note length of tarsal claws).

sensory papillae arranged in a single row along anterior margin; number of setae on inner edge of the lacinia varying from four to six; maxillary palpus six segmented.

Prothoracic sternal plate with three pair of setal tufts; mesothoracic sternal plate with one pair setal tufts; metathoracic sternal plate with one pair of setal tufts.

Tergite X, with tip narrowed, rounded, wider than long. Outer dorsal setal combs on abdominal tergites I-VIII; abdominal tergites II-VII with 3+3 setal combs (i.e. three on lateral aspect of each tergite); tergite I with 1+1 [2 dorsal (inner) pair lacking]; tergite VIII with 2+2 (subdorsal pair lacking); IX with none; X with 1+1. One pair of sublateral ventral setal combs on sternites IV-VIII and a single median row on sternites III-VII. Styli present on gonocoxites of segments VIII and IX: those on IX longer; ovipositor short and stout not extending beyond gonocoxites of sternite IX.

Male: like the female, except for differences in genitalia and while the gonocoxites of female are long and narrow, those of male are short and broad.

Holotype: SALTON SEA BEACH, IMPERIAL CO., CALIFORNIA, 22 April, 1951 (W. J. Wall and R. C. Bechtel).

Material examined. California: Magnesia Canyon, Riverside Co., 21 April 1951 (W. J. Wall and E. I. Schlinger); Borego Junction, San Diego Co., 22 April 1951 (W. J. W.); Borego Valley, San Diego Co., 22 April 1951 (W. J. W. and E. J. Taylor); 10 mi. W. of Truckhaven, San Diego Co., 11 April 1952 (W. H. Lange).

DISCUSSION. The only variations of the characters described above are as follows: the number of setal tufts on the lateral margins of the prothoracic sternite may vary from two to four, and faint pink pigmentation may be present or absent on the thoracic nota.

The description of the holotype was made from a single specimen now preserved in alcohol. However, the writer's concept of this genus and species is based on 5 ♀♀ and 9 ♂♂ which were studied alive and later in alcohol. Some of the original members of the type series were dissected and used for study of the internal anatomy and in part are mounted on slides in the possession of the writer. The remaining complete specimens consisting of the holotype ♀ and 4♂♂ paratypes have been deposited at the California Academy of Sciences, San Francisco, California.

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PACIFIC COAST ENTOMOLOGICAL SOCIETY

J. Gordon Edwards	J. W. MacSwain	D. D. Jensen
Vice-President	*President*	*Secretary*

Proceedings

Two Hundred and Twenty-eighth Meeting

The two hundred and twenty-eighth meeting of the Pacific Coast Entomological Society was held at 2:00 p. m. on Saturday, January 31, 1953, in the Morrison Auditorium of the California Academy of Sciences, San Francisco. President MacSwain conducted the meeting. The following members were present: G. F. Ferris. R. Matsuda, J. W. Tilden, Laura M. Henry, Paul Bartholomew, Paul Arnaud, J. P. Harville, Lorin Gillogly, J. G. Edwards, P. D. Hurd, Jr., J. D. Lattin, C. Don MacNeill, W. C. Bentinck, W. V. Garner, E. O. Essig, A. E. Michelbacher, W. W. Middlekauff, W. D. Murray, E. S. Ross, K. F. Innes, J. W. Green, R. F. Smith, E. G. Linsley, C. E. Kaufeldt, J. W. MacSwain, D. G. Denning, H. B. Leech, W. C. Day, R. L. Usinger, and D. D. Jensen. The following visitors were present: Jacob Bergamin, Mir Mulla, S. Abul Nasr, Mostafa Hafez, J. W. Chapman, J. Nelson, Mrs. John Nelson, Mrs. Lorin Gillogly, Alan Gillogly, James Gillogly, Barbara Hovanitz, Wm. Hovanitz, Joseph E. Ryus, Joan Linsley, and Mrs. Leslie H. Burman.

The minutes of the meeting held December 6, 1952, were read and approved.

Mr. John O. Stivers was elected to membership in the Society.

In response to President MacSwain's call for notes and exhibits, Dr. Ross exhibited a California tarantula collected by Dr. F. X. Williams near Mt. Diablo. The spider had been stung by a *Pepsis* wasp about July, 1952, and was still alive at the time of the exhibit although paralyzed. When first received, the spider could scarcely move its appendages. At this date the paralysis had considerably reduced and the spider could almost walk again. It is very doubtful that the spider could recover sufficiently to secure food and survive.

Professor Ferris displayed a pre-publication copy of Dr. Cook's "Ants of California."

Dr. MacSwain reported that the Society's gavel had been used at a number of historic meetings of the national entomological societies last December in Philadelphia. Dr. Linsley had requested the use of the gavel and reported that it had been used at the last meeting of the Entomological Society of America, the joint executive committee meeting of the Entomological Society and the American Association of Economic Entomologists, and finally it was used at the first meeting of the first governing board of the new Entomological Society of America, following the amalgamation of the two societies.

Dr. MacSwain showed photographs of cells of two species of andrenid bees which had been parasitized by anthophorid bees. These anthophorid

bees, belonging to the genera *Nomada* and *Holonomada,* apparently lay two eggs in each cell they parasitize. Thus when several parasitic bees have visited the same cell, four or even as many as six eggs are to be found inserted into the walls of the cell. The first parasitic larva to hatch immediately searches out the other eggs and destroys them with its well developed mandibles. This larva does not feed on the eggs it destroys but after crushing them searches out the egg of the host bee and consumes it. Later the pollen and nectar mass stored by the *Andrena* is eaten by the parasite. It would appear that this multiple oviposition by the parasite has two principal advantages to the species. In the first place, the parasite's egg must hatch well ahead of that of the host bee. Thus by placing two eggs in each cell, the parasitic species insures extreme selection for a minimum incubation period. The second advantage would be to insure the production of a parasite in the event of the destruction of one egg by some other agent.

Dr. MacSwain introduced Dr. John Smart, Lecturer in Zoology, University of Cambridge, who spoke on the subject "Wicken Fen, Cambridgeshire, A British Nature Reserve." Dr. Smart's discussion, which was supplemented by pictures, is summarized below.

One of the oldest nature reserves created by private effort in the United Kingdom is that at Wicken Fen, Cambridgeshire. It is a small reserve when measured against the national parks and other reserves of the North American continent, being only a little more than one square mile in area. To some extent the land has been modified by the operations of man but not nearly to the extent that has the surrounding countryside which has been drained and modified by intensive agriculture.

Wicken Fen has been relatively little interfered with and it represents the condition in which the whole of "Fenland" existed in medieval times before drainage and other improvements were carried out. "Fenland" is a large area extending roughly from Lincoln to Suffolk and from Huntingdon to King's Lynn. It is a shallow basin with very poor water drainage, and in olden days was one vast marsh with, here and there, small areas of raised land called "islands" upon which there were such human settlements as existed. One of the most typical of these "islands" is the Isle of Ely with its well-known cathedral.

The whole area is apparently slowly sinking; robably the whole of the North Sea area was at one time covered with "fen". On the higher land there were forests of oaks but as the land sank these trees were killed and marsh plants multiplied in the fresh water that accumulated and formed the vast marshes. Gradually the marshes filled up with peat and the oak trees, now called "bog oak," were preserved under the peat.

The peat is 16 to 18 feet thick. The greatest draining activity took place in the 17th century, when great areas were drained and prepared for agriculture which is now intensive over nearly the whole of Fenland. Wicken Fen, with on or two other even smaller areas, are all that is left of the medieval "Fenland." Their importance from the conservancy point of view is that they are the sole surviving samples of what this medieval fen-flora and fen-fauna were like and their possible interest when considered as survivors of the even more extensive fens of the pre-historic period.

Wicken Fen requires considerable management. It is in the last stages of the formation of dry land from peat-bog and is largely covered with sedge *(Cladium)*. If left completely to itself it would become covered with bushes and possibly at a later stage with trees. The objective in its management is the maintenance of the conditions of the wet sedge-fen which is the flora association that follows that of reeds *(Phragmites)*, which require a certain depth of water over the peat and that precedes that of the bushes which, with the moor grass *(Molinia)*, requires the plant's base, but not the root system, to be clear of the permanent water table.

Wicken Fen is probably best known as one of the homes of the rare British Swallow-tail Butterfly *(Papilio machaon brittanicus* Seitz), and of the experimental attempts to replace the Large Copper Butterfly *(Lyceanea dispar dispar* Haworth), which became extinct, with the Dutch race of this butterfly *(Lyceanea dispar batavus* Oberth.). Collecting of the first named is carefully restricted; unfortunately the colony of the latter died out during the last war.

Dr. Smart's address resulted in a discussion which included consideration of nature reserves in the San Francisco Bay region. Dr. Ross, who raised this point, suggested that some of the Antioch sand dune area would be desirable to conserve. Following Dr. Usinger's proposal that the Society take the initiative in the matter, President MacSwain appointed Dr. Usinger and Dr. Hurd as a committee to investigate the feasibility of the idea.

At the close of the discussion the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Twenty-ninth Meeting

The two hundred and twenty-ninth meeting of the Pacific Coast Entomological Society was held at 2:00 p. m. on Saturday, March 7, 1953, in the Morrison Auditorium of the California Academy of Sciences, San Francisco. President MacSwain conducted the meeting. The following members were present: J. W. MacSwain, Owen Bryant, E. S. Ross, L. R. Gillogly, P. S. Bartholomew, Wm. Hazeltine, Victor Stombler, H. B. Leech, A. E. Pritchard, R. D. Morgan, D. D. Linsdale, Gordon Marsh, W. V. Garner, J. D. Lattin, T. F. Leigh, K. S. Hagen, J. J. Drea, W. C. Day, R. L. Usinger, K. F. Innes, Jr., C. E. Kaufeldt, C. W. Hildebrand, J. R. Helfer, J. G. Edwards, D. P. Furman, B. F. Augustson, L. A. Wood, Jr., H. H. Keifer, E. L. Kessel, E. O. Essig, J. W. Tilden, Benjamin Keh, John O. Stivers, and D. D. Jensen. Visitors were present as follows: Mrs. Lorin R. Gillogly, James J. Gillogly, Alan R. Gillogly, N. D. Walker, Gerald Kraft, Mir Mulla, Mrs. Carl Miescke, Carl Miescke, Don Burdick, Albert Alberts, Lois May Bastian, James W. Chapman, Lloyd A. Andres, Robert L. Langston, Kenneth M. Fender, Edmond O. Loomis, Albert Rudnick, and S. McAgley.

The minutes of the meeting held January 31, 1953 were read and approved.

Donald J. Burdick was elected to membership in the Society.

President MacSwain appointed Dr. Middlekauff and Dr. Tilden to fill the vacancies in the Membership Committee and Mr. Paul Arnaud to the Program Committee.

By a unanimous vote of the members present, Dr. Usinger was authorized to serve as the official representative of the Society at the 14th International Congress of Zoology to be held at Copenhagen, Denmark, August 5–12, 1953.

In response to the President's call for notes and exhibits, Dr. Furman displayed an adult female of *Otobius megnini*, the spinose ear tick, as an example of potential longevity of the species when held under laboratory conditions. This specimen was taken as a nymph on December 16, 1949, from a human host. The normal hosts are sheep and other ruminants. After being held in a pill box for over three years until March 6, 1953, the specimen was found to have moulted. The resulting adult female is active and only partially depleted of food reserve.

Dr. Tilden announced that the Lepidoptera Society would hold its annual meeting in Los Angeles, July 2–5, 1953.

Dr. MacSwain pointed out that the very mild winter, followed by a long period of no rain, had permitted colonies of the common yellowjacket, *Vespula pennsylvanica* (Saussure), to survive the winter. Several strong colonies have been noted around Berkeley in February although this ground-nesting species is normally represented by overwintering queens.

Dr. Tilden remarked that *Diabrotica undecimpunctata* Mannerheim adults had been active all winter in the vicinity of San Jose until within the last two or three weeks when the coldest weather had occurred.

Mr. Hazeltine exhibited one male of *Pleocoma lucia* Linsley and three males of *P. nitida* Linsley. Notes on the flight habits and distribution were shown with the specimens in the hope of obtaining additional specimens with exact data.

Mr. H. B. Leech showed part of the comb from a 4-comb nest of yellowjacket wasps, *Vespula* sp. (probably *arenaria* Fab.), taken from a tree in Mill Valley, Marin Co., Calif., in early September, 1952. During September and October 60 *Sphecophaga burra* Cresson emerged, and pupal cells of about as many more were present; the species is a widely distributed primary parasite of *Vespula*. Also obtained during the same period were 5 adults of a scavengering lepidopteran, the dried fruit moth *(Vitula serratilineella* Ragonot, det. E. G. Munroe) and 52 of its primary parasites, a species of Braconidae. A single tiny anthocorid bug emerged; it appears to differ from any in the Academy collection.

Dr. Edwards circulated a copy of the new book on Insect Physiology, edited by Rader of Tufts College.

Dr. Usinger displayed some of the plates, illustrating California water bugs, which had been drawn by Arthur Smith of the British Museum. The excellence of his figures indicates that he is one of the finest illustrators of insects living in the world today.

President MacSwain then introduced the main speakers of the day. Professor A. E. Pritchard, of the University of California, Berkeley, spoke first on "A Review of the Biology of Mites." He was followed by Mr. C. Donald Grant, San Mateo County Mosquito Abatement District, who discussed "Some Morphological Differences between Insects and Mites."

An abstract of Mr. Grant's paper follows:

The divergencies between insects and mites began as far back as the early Cambrian Period when the Chelicerata arose from the Trilobite-like ancestors of the Insecta. The subsequent evolution of these lines has permitted only the most rudimentary homologies to persist, while the gross modifications of form have rendered even these somewhat obscure. Convergent evolution has yielded many similarities of form between existing representativs of these groups, but brings their homologous relationships no closer.

The relatively few specialists working with the Acarina and the paucity of representative material collected, afford only a meager understanding of the comparative morphology of mites in comparison with the level attained in the insects. The work with mites is further complicated by their probable polyphyletic origin, i.e., affinities to the Opilionids and Solpugids.

An initial step in comparing the morphology of mites and insects lies in determining their corresponding segmental relationships, especially with regard to head and mouthparts. Snodgrass, in 1948, published a comprehensive paper on arachnid mouthparts, indicating their common relationships and attempting to overcome the confusion resulting from multiple terminology. If one disregards Snodgrass' assignments as to segmental constitution, it is found that the basic constituents of the arachnid mouthparts and legs conform admirably with the first nine segments of the insect body as recently brought forth in papers by Ferris and Henry (1948). Substantiating evidence as to the arrangement of homologous segments in the mites will demand further studies of the nervous system and musculature therein. Diagrammatic orientation and terminology of the mouthparts of a typical mesostimgatic mite were shown in projected illustrations, as were also variations in the morphology of the body, respiratory orifices, and appendages of certain mites.

Following a discussion, the meeting was adjourned.—D. D. JENSEN, *Secretary.*

Two Hundred and Thirtieth Meeting

The two hundred and thirtieth meeting of the Pacific Coast Entomological Society was held at 7:30 p. m. on April 11, 1953, in the Morrison Auditorium of the California Academy of Sciences, San Francisco. President MacSwain conducted the meeting. The following members were present: J. G. Edwards, Alice Gray, E. G. Linsley, P. A. Adams, G. F. Ferris, J. W. Tilden, Victor Stombler, Laura M. Henry, A. E. Pritchard, P. H. Arnaud, G. F. Augustson, E. L. Kessel, W. C. Day, Harry Chandler, L. R. Gillogly, W. W. Sampson, H. B. Leech, J. D. Lattin, E. E. Gilbert, Wm. V. Garner, Owen Bryant, Thomas Lauret, W. B. Murray, D. G. Denning. R. F. Smith, P. D. Hurd, Jr., Roy Snelling, K. F. Innes, Jr., E. S. Ross, J. W. Green, Benjamin Keh, R. C. Miller, J. W. MacSwain, and D. D. Jensen. Visitors were present as follows: Mary H. Swezey, Otto H. Swezey, Mrs. G. F. Augustson, Alan R. Gillogly, Mrs. L. R. Gillogly, Jim Gillogly, Mrs. O. Bryant, Robert Langston, Dwight W. Pierce, and James W. Chapman.

The minutes of the meeting held March 7, 1953, were read and approved.

Dr. R. F. Smith, chairman of the program committee, announced that the annual field meeting would be held May 3, 1953, at Russelman Park, Contra Costa County.

In response to the president's call for notes and exhibits, Dr. Hurd reported on the collecting results of the Hurd-Smith study of the genera *Diabrotica* and *Pepsis* in Mexico, sponsored by the Associates in Tropical Biogeography, University of California. He stated that the collecting expedition of the 1953 dry season in Mexico centered its field activities largely in the states of Chiapas and Oaxaca. He exhibited material of these genera which helps to demonstrate that a number of species formerly known to occur in northern South America range northward well into southern Mexico. In addition, he displayed the cells of the Anthophorid bee, *Melitoma*, and the results of preliminary rearing which included a number of parasites and inquilines and an apparently new species of Mantispid. This bee was found nesting in the state of Chiapas, Mexico.

Dr. Pritchard reported that a new family of prostigmatic mites had been discovered on cockroaches in the eastern United States. This is a remarkable finding in that, in many respects, the new family is a connecting link between several families of predacious mites and several families of plant feeding mites.

Dr. R. F. Smith called attention to the fact that the summer meetings of the Pacific Slope Branch of the Entomological Society of America would be held at Lake Tahoe in June.

Dr. Linsley displayed specimens of *Glaresis ecostata* Fall (Scarabaeidae) which has been a very rare species. The present collection is of unsual interest because the beetles wer taken in large numbers coming to light many of them covered with mud. They were collected at a camp on the Mojave River at Cronese, San Bernardino County, California, April 3, 1953, by Dr. Linsley, Dr. MacSwain and Dr. R. F. Smith.

Dr. MacSwain extended a special welcome to Dr. and Mrs. Otto H. Swezey who, since 1904, have been engaged in enomological work in the Pacific Ocean area and in particular in the Hawaiian Islands where Dr. Swezey was entomologist for the Hawaiian Sugar Planters' Association Experiment Station.

Dr. MacSwain then introduced Dr. W. Dwight Pierce, Curator of Entomology (Retired), Los Angeles County Museum, who spoke on the subject "How Insects Become Fossils." Dr. Pierce's address, which was illustrated with colored slides, is summarized below.

The palaeoentomologist must think ecologically to properly understand the insect deposits he studies. The forces which have contributed most to our records are: the waves, winds, and sands of the sea shore; the sands and dusts of arid countries; land slides; glaciers and river floods, swamps, and marshes; volcanic lava and dust, and hot mineral waters; asphalt seeps and bogs; and the resins dripping from trees.

On the seashore many insect fragments are washed in and may find lodgement in piles of kelp and later be buried in the sands. Most shales are laid down by sedimentation in water, and many of the fine insect fossils are in shales. Mud deposits often contain insects, and soft muds and silts often take the imprints of arthropods. Sometimes these prints are permanently set and become fossil records.

While volcanic lava is too hot to preserve insects, it may conserve those

underlying it. Volcanic ash deposits preserve the species they bury. Much of the fossil wood of America was the result of volcanic explosions, and dust covering. The workings of insects in wood are presrved in the fossils, although crystallization may change the appearance.

Volcanic hot waters in mineral wells kill many insects, and if highly mineralized will crystallize upon the insects. At Hot Mineral Spring, north of the Salton Sea, many insects are being preserved. This is the first step toward formation of onyx marble.

At Bonner Quarry, Kaibab National Forest, Arizona, onyx marble formed in the crevices in faulted Permian rock has been found to contain very primitive earth dwelling insects.

Petroleum deposits at Carpinteria, Sulphur Mountain, McKittrick, and Los Angeles are preserving multitudes of insects. Those at McKittrick are stratified at the rate of 25 years to the inch, and the deposits go back to Middle Pleistocene. Many water insects are found in all of these petroleum deposits because, from above, the tar probably looks like water.

The glaciers of the Pleistocene period laid down layers of peat and lignite in which many fine insects have been preserved, especially at North Vancouver, British Columbia, and in Pennsylvania. The coal deposits of the world are millions of years older and contain many fine specimens of ancient insects.

The resins of trees of long ago and the resins of today are responsible for the preservation in perfect shape of many insects.

Following a discussion of Dr. Pierce's paper, the meeting was adjourned.

—D. D. JENSEN, *Secretary*.

Two Hundred and Thirty-first Meeting

The annual field meeting of the Pacific Coast Entomological Society was held at Russelman Park, Contra Costa County, May 3, 1953.

The recorded attendance of 66 persons included 21 members and 45 visitors. Members were present as follows: D. D. Jensen, J. W. MacSwain, P. S. Bartholomew, L. R. Gillogly, P. H. Arnaud. R. Matsuda, Roy Snelling, W. W. Middlekauff, E. O. Essig, J. G. Edwards, J. W. Tilden, H. F. Madsen, R F. Smith, E. S. Ross, E. G. Linsley, Owen Bryant, H. B. Leech, W. C. Day, A. E. Michelbacher, W. H. Lange, and Don Burdick. The following visitors were present: G. W. Bane, Doris F. Jensen, Diana, Anita, Patricia and Carol Jensen, Mrs. Lorin R. Gillogly, Allan and James Gillogly, Mrs. John MacSwain,Tinker and Nancy MacSwain, Mrs. Marguerite Arnaud, Mrs. Charlotte Snelling, Marie Essig, Martha Michelbacher, Phyllis Middlekauff, Jeffrey and David Middlekauff, Alice Edwards, Jane Ann Edwards, Hazel Tilden, Jimmy and Bruce Tilden, Catherine Madsen, Carol, Bobby and Kenny Madsen, Libby Smith, Kathy, Tommy and Donald Smith, Mrs. E. S. Ross, Martha and Clark Ross, Jim Linsley, Juanita Linsley, Joan Linsley, Lucy Bryant, Thomas Leech, Mary Leech, Helen L. Day, Pauline S. Lange, Marilyn, Diana and Becky Lange, and Harry S. Creegor.

Since the park was not open to the public in 1953 the Society had exclusive use of the facilities. The weather was ideal for outdoor activities which included a spirited game of softball, volleyball, and collecting, both

aquatic and terrestrial. The group included 25 children who thoroughly enjoyed the sports and exploring the area around the pond and stream.—D. D. JENSEN, *Secretary.*

Two Hundred and Thirty-second Meeting

The two hundred and thirty-second meeting of the Pacific Coast Entomological Society was held at 7:30 p. m. on Friday, October 30, 1953, in the Morrison Auditorium of the California Academy of Sciences, San Francisco. President MacSwain in the chair. The following members were present: A. E. Michelbacher, E. O. Essig, W. W. Middlekauff, E. S. Ross, P. A. Adams, G. A. Marsh, W. C. Day, P. H. Arnaud. G. F. Ferris, R. L. Usinger, W. Harry Lange, K. F. Innes, J. W. Tilden, L. M. Henry, Victor Stombler, J. G. Edwards, Thomas Lauret, H. B. Leech, J. D. Lattin, W. V. Garner, H. L. Hansen, Don Burdick, J. O. Stivers, P. A. Harvey, R. F. Smith, E. G. Linsley, D. D. Jensen, Glen M. Cagley, Jane MacSwain, J. W. MacSwain, Gerald Kraft, Joseph Kamp, George Reichart. The following visitors were present: Dr. and Mrs. Otto H. Swezey, Mrs. W. C. Day, Carlo Gemignoni, March Pitman, Leta Rae Lauret, Vincent D. Roth, Joseph E. Ryus, Stephen W. Hitchcock, Libby Smith, Juanita Linsley and Mrs. George Reichart.

The minutes of the meetings held April 11 and May 3, 1953, were read and approved.

The following were elected to membership in the Society: Joseph W. Kamp, Gerald F. Kraft, George B. Reichart, Glen M. Cagley, Mrs. J. W MacSwain, Professor W. J. Chamberlin, and Hirohiko Nagase, Kanagawa Pref., Japan.

President MacSwain appointed Dr. Usinger, Dr. Tilden and Dr. Ross to serve as a nominating committee to propose a slate of officers, at the next meeting, to serve during 1954.

President MacSwain discussed amendments to the By-Laws of the Society which have been approved by the Executive Board and stated that the proposed changes in wording would be mimeographed for distribution at the next meeting.

Before calling for notes and exhibits, President MacSwain announced that the speaker for the evening, Dr. P. D. Hurd, who was to have spoken about the insect fauna of Point Barrow, Alaska, was ill and unable to attend the meeting.

Dr. Tilden reported the collection of six species of Lepidoptera, two Diptera and a beetle which were of special interest. *Philotes rita* B. McD., once thought to be very rare, is now known to be common in association with *Eriogonum wrightii* and related plants. The insects seldom go more than a few feet from the plants. The larvae feed on the flower heads, and the adults visit the flowers.

Hesperia uncas lasus Edw. Described from southern Arizona. Known collections are few. In the grasslands between Prescott and Mingus Mt., about 75 adults were collected in about two hours between thunder-showers in August, 1953. Most of them were females.

Three species of butterflies have been added to the well-collected Santa Clara County area in the last two years. *Philotes enoptes* was found on flowers

of *Eriogonum wrightii* in September, 1953. Two males of *Erynnis lacustra* Wright were found near the summit of Mt. Hamilton. A few individuals of *Strymon auretorum* Bdv. were found in Arroyo Bayo. The larva feeds on Blue Oak, *Quercus douglasii.*

Mitoura nelsoni muiri Hy. Edw. has been shown to be the Coast Range subspecies of this species. The food plant seems to be *Libocedrus decurrens,* incense cedar.

Cuterebra sp., a rodent bot, has been taken several times in Arizona. The adults are attracted to water which is strange, since the adults have atrophied mouthparts. Larvaevorid or tachinid flies, of several species and in considerable numbers, were found attracted to the flowers of Cliff Rose, *Cowania* sp., in Oak Creek Canyon, Arizona.

Moneilema gigas Lec. (Coleoptera). A single specimen was taken in Wickenburg, Arizona.

Mr. Lattin reported that on a trip last summer with Dr. Usinger and Mrs. Lattin an interesting collection had been made at Hot Creek, Mono County, California. At the edge of the hot pools, under rocks and other debris, nymphs and adults were collected of a new species of *Cryptostemma,* of the hemipterous family Cryptostemmatidae. These small (1–2 mm. in length), active bugs should be looked for in similar habitats throughout California and other western states. Specimens of the closely allied genus *Ceratocombus,* have turned up in Berlese samples of leaf litter from southern California to the north coastal area. As in *Cryptostemma* the adults are small, brown and very active. While these bugs are known to be predacious, their distribution is poorly known due to their small size and their specialized habitat. Further collecting will greatly clarify the systematics of this group.

Gordon Marsh presented notes on soil inhabiting organisms which he and R. O. Schuster have collected from soil and litter in Berlese funnels. The first samples were taken during January, 1953. Considerable stress was placed on the accumulation of pselaphids, and in particular the genus *Pselaptrichus.* Thus far seven new species have been found in this genus. Samples have been taken from Santa Cruz, Alameda, Contra Costa, Marin, Sonoma, Mendocino, Humboldt and Del Norte Counties and from portions of the Sierra Nevada and Panamint Mountains.

It is of interest that Protura have been found throughout the year rather than only during the moist fall and winter months. A large number of Protura, identified by Dr. MacSwain as *Eosentomon pallidum,* were taken at Freshwater, Humboldt County, California. The only previous record from the state was from a peach orchard at Yuba City. This species represents one of the most archaic groups because it has spiracles.

An interesting sidelight of this study is the discovery of a number of species of Coleoptera in which there has been a total loss of functional eyes. These occur in the families Carabidae, Staphylinidae, Scydamaenidae, Silphidae, Lathridiidae and Curculionidae.

Mr. Leech reported a gift to the Society of $15.00 from F. C. Hottes. He also reported the collection of *Stator limbatus* (Horn) (Bruchidae) at Clear Lake, California. This species was described from Lower California and

Sonora, Mexico. It is recorded from Texas, Arizona and southern California. There are no specimens in the California Academy of Sciences Collection from farther north than Santa Monica, Los Angeles County, California.

Adults were taken in numbers at Lucerne, on the east side of Clear Lake, Lake County, on August 29, 1953 by Mr. and Mrs. Leech. They were on the flower heads of coxcomb *(Celosia argentea* var. *cristata)*, but were presumably coming from leguminous trees nearby, since our Santa Monica specimens were reared from the seeds of *Acacia cultriformis*. The beetles were identified by L. J. Bottimer.

Dr. Lange reviewed the 1953 outbreak of the rice leaf miner, *Hydrellia griseola* var. *scapularis* Loew in California. From 10 to 20 per cent of the rice crops was destroyed by this insect, resulting in a loss of approximately $16,000,000. In addition $1,200,000 were spent for insecticide control of the pest. He discussed its life history, and suggested that future outbreaks might be prevented by proper crop management, particularly that of water level in the rice fields.

Dr. Edwards exhibited adults, larvae and eggs of *Amphizoa* (Amphizoidae). The eggs are extremely large and the ocelli of the larvae are visible through the egg-coat. The larvae are doubled up but when they emerge from the eggs are about 3½ mm. long as the first instar of beetles which are only about 12 mm. long as adults. It was most interesting that the young larva looks just like the later instars, because the only closely related genus known is *Pelobius* (Pelobiidae), whose first instar larva is said to be "nauplius"—like larva similar to those of Crustacea.

Dr. Otto H. Swezey reported a remarkable instance of polyembryony which he had recorded this season. His observations follow: "From February to May of this year an occasional cutworm caterpillar of the species *Lycandades purpurea crispa* Harv. was found in garden work and weed pulling at my new home on Fleming Avenue, at the base of the foothills east of San Jose, California. A few moths were reared, but one full-grown caterpillar which was found under a board on March 28 failed to pupate, apparently remaining dormant through the summer months, in the soil of the small jar in which it was held for observation. Finally, on September 15, this jar was found to be swarming with chalcid parasites. Being a rather strange situation, these parasites were killed and carefully counted, with a total of 1051, and probably a few were missed.

"The empty dry skin of the caterpillar was examined and found to be perforated with numerous tiny holes where the adult parasites had issued. This furnishes a remarkable record of polyembryony.

"The moth which is host in this case was kindly determined by Dr. J. W. Tilden of San Jose State College. The species of the parasite yet remains undetermined."

Dr. Jensen reported three recent developments of interest in the field of plant virus transmission by insects and mites. Roger M. Drake, Deputy Agricultural Commissioner of San Luis Obispo County, recently reported that the aster yellows virus had caused a loss of from 10 to 50 per cent (average 30%) of the two and one-half million dollar celery crop in the Arroyo Grande Valley in 1953. In 1952 the loss also ranged from 10 to 50 per cent

and in 1951 from 2 to 30 per cent.

Black (Phytopathology 43:466) maintained two strains of potato yellow dwarf virus in plants without insect transmission for 12 and 16 years. When tested with 454 leafhoppers, the virus had lost its transmissibility by these insects, whereas 433 control insects produced 102 infections with fresh isolates of the virus from the field. Dr. Black believes the property of transmissibility by specific vectors was lost through mutation during the years the virus strains were kept in plants without insect transmission.

Dr. Slykhuis (Phytopath. 43:484) announces that the eriophyid mite *Aceria tulipae* Keifer, is the vector of wheat streak mosaic virus in South Dakota. This is only the second plant virus shown to be transmitted by mites.

Dr. Usinger displayed Dr. Ross' new book "Insects Close Up" and commented on the wide publicity and favorable reception being accorded the work.

Dr. Ross reported the recent purchase, by the California Academy of Sciences, of the Howard M. Parshley collection of Heteroptera, consisting of 26,000 mounted specimens most of which are named. Dr. Ross brought the collection from Northampton, Mass., to California by car and en route continued his project of color photography of living insects. Some of his recent pictures were projected on the screen.

Paul H. Arnaud also showed slides of a collecting trip taken into the Sierra San Pedro Martir Mountains of Baja California.

During the last portion of the meeting Dr. Usinger commented briefly on his recent trip to Europe and on the Fourteenth International Congress of Zoology held at Copenhagen. He showed a series of his pictures which had been selected primarily to show a number of the scientific museums of Europe and some of the people who were at the Congress or at the museums.

The meeting was adjourned at 9:30 p. m.—D. D. JENSEN, *Secretary*.

Two Hundred and Thirty-third Meeting

The two hundred and thirty-third meeting of the Pacific Coast Entomological Society was held at 2:00 p m. on Saturday, November 28, 1953, in the Morrison Auditorium of the California Academy of Sciences, San Francisco. President MacSwain conducted the meeting. The following members were present: W. C. Day, H. B. Leech, W. R. Kellen, E. O. Essig, A. E. Michelbacher, L. R. Gillogly, W. V. Garner, K. S. Hagen, J. J. Drea, E. E. Gilbert, P. H. Timberlake, H. P. Chandler, W. H. Lange, E. G. Linsley, V. Stombler, P. H. Arnaud, E. S. Ross, J. W. Tilden, J. G. Edwards, G. Kraft, B. Keh, E. L. Kessel, G. M. Cagley, G. F. Ferris, R L. Usinger, C. E. Kaufeldt, P. S. Bartholomew, J. W. Green, B. Brookman, R. F. Smith, D. D. Jensen, J W. MacSwain, J. E. Swift, and E. C. Loomis. Visitors were present as follows: Jim Gillogly, Mrs. L. R. Gillogly, Allan Gillogly, Lloyd H. Shinners, Joan Linsley, James W. Chapman, Hazel Tilden, John C. Downey, William Hovanitz, Bruce Eldridge, B. F. Sargent, Vince Roth, and Pauline S. Lange.

The minutes of the meeting held October 30, 1953, were read and approved.

The following were elected to full membership in the Society: Miss Hilary Hacker, Tom S. Briggs, William Anthony Doalin, John Charles Dow-

ney, John E. Swift and Edmond C. Loomis. William R. Kellen was elected to student membership.

President MacSwain called for the reports ordinarily given at the annual meeting of the Society. In the absence of Dr. Miller, the treasurer's report was not available.

Mr. Leech announced that, because of the pressure of other work, it was necessary for him to resign as co-editor of the Pan-Pacific Entomologist. A motion, made by Dr. Usinger, was passed expressing the appreciation of the Society for the excellent service Mr. Leech rendered during his tenure as editor.

President MacSwain briefly explained the proposed amendments to the By-Laws of the Society which had been mimeographed and were distributed to the members at the beginning of the meeting. A motion was made, seconded and passed that the By-Laws of the Society be amended as follows:

AMENDMENTS TO THE BY-LAWS OF THE PACIFIC COAST ENTOMOLOGICAL SOCIETY

November 28, 1953

PRESENT WORDING	PROPOSED WORDING
Article IV, Section 4: . . . The treasurer who is hereby granted authority to expend the money necessary to send out notices of meetings and to defray expenses, send out bills, etc., in conjunction with publication of the Pan-Pacific Entomologist.	. . . . The treasurer who is hereby granted authority to expend the money necessary to send out notices of meetings and to defray expenses, send out bills, etc., in connection with *publications of the Society and such other necessary expenses of the Society as are approved by the Executive Board.*
Article V, Section 2, paragraph 2: The Publication Committee shall appoint an editorial board for the Pan-Pacific Entomologist consisting of an editor (or editors) and such associate and assistant editors and advisory members as may be deemed necessary.	The Publication Committee shall appoint *editorial boards for the Pan-Pacific Entomological and other Society publications*, consisting of an editor (or editors) and such associate and assistant editors and advisory members as may be deemed necessary.
Article V, Section 4, last sentence: It shall further be the duty of the committee to consider members' applications for *associate and* student status and to review the membership from time to time for persons to be nominated as Honored members.	Delete: "associate and"
Article VI, Section 3: The annual dues shall be $3.00 for regular members, $2.00 for *associate* and subscribing members.	The annual dues shall be *$5.00* for regular members, *$4.00* for subscribing members. . . . .

Article VI, Section 4: Any member may become a life member by the payment of $50 in one sum and shall thenceforth be freed from payment of annual dues.	Any member may become a life member by the payment of *$75* in one sum and shall thenceforth be freed from payment of annual dues
Article VI, Section 5: Any regular member who lives at such a distance from the place of meeting that attendance is not practicable may, upon request, be made an associate member. The dues for associate members shall be $2 per year. Associate members may resume regular status by payment of the regular $3 dues.	Delete entire section Replace with: *Members who are in good standing, and who have retired from active service may, on request, be continued as active members without payment of dues. Moreover, such members, if they desire, may receive the Pan-Pacific Entomologist upon payment of $1 per year.*
Article VI, Section 8: All members except for student members or as herein otherwise provided shall receive the publications of the Society with no additional charge.	All members, except for student members, *retired members* or as herein otherwise provided shall receive the *Pan-Pacific Entomologist* with no additional charge.

Upon a motion made by Dr. Usinger, Dr. Otto H. Swezey was made a Retired Member of the Society. Dr. Swezey thus becomes the first to receive this special type of membership for retired entomologists just created by the above amendments to the By-Laws.

In response to the President's call for notes and exhibits, Professor Essig reported that in August, 1953, he had attended the Rocky Mountain Entomological Conference held at Pingree Park, Colorado. This three-day conference, held annually in recent years, was attended by approximately 150 people. Many of the entomologists in attendance brought their families with them because the program provides for hiking and social activities as well as for relatively informal entomological meetings.

Mr. Paul Allen reported that *Trogoderma granarium* Everts, a dermestid of oriental origin, was found recently in wheat and barley stored at Angiola and Alpaugh in Tulare County. The infestation at Alpaugh was very heavy. The larvae tend to congregate on top of the grain and at the sides of the bins.

It is probable that other grains are also good food for this beetle. A survey of other warehouses has disclosed an infestation of several years' standing in Fresno. This had been quite thoroughly cleaned up, but probably was the source of the other two known infestations in California. Under favorable conditions there may be several generations a year, but under unfavorable conditions the larvae may survive two years. The survey is continuing.

Dr. Linsley was asked by Mr. Allen to comment on the discovery of this pest in California because the original collection and determination of the beetles had been handled by the University of California. Dr. Linsley reported that the insects were first sent in by the Tulare County Farm Advisor's Office in October, 1953, to J. E. Swift, Extension Entomologist. They were examined by Dr. Linsley who recognized the beetles as belonging to the genus *Trogoderma* and representing a species not common to this area and

possibly an important pest. Dr. Linsley suggested the beetles be immediately sent to Dr. Beal of Denver, Colorado, who has recently re-worked all the species of this genus. Dr. Beal determined the beetles as *Trogoderma granarium* Everts. He notified Mr. Swift, who in turn immediately informed Mr. Armitage, Chief of the State Bureau of Entomology.

Dr. Usinger exhibited specimens of *Aradus evermanni* Van Duzee (Aradidae) and reported that during the summer field course, Entomology 49, entomology students of the University of California collected specimens found resting on tent canvas at their camp on White Mountain. This species is rare in collections and scattered in its recorded distribution. Described from San Francisco, it has since been found elsewhere in California and in Arizona and Texas. It was not recorded by Linsley and Usinger in dispersal flights at Mt. Lassen (Pan-Pacific Ent. 18:84, 1942) or Yosemite (Pan-Pacific Ent. 20:111, 1944).

Aradus evermanni belongs to the Lugubris Group (Parshley, 1921), all members of which are usually found in flight or resting on walls, tents, screens, etc. The precise habitat is not known for any of these species including the common Holarctic *Aradus lugubris* Fallen. The occurrence of *A. evermanni* at 10,000 feet on White Mountain in July is interesting because the only coniferous trees in the vicinity were *Pinus flexilis* James and *Pinus aristata* Engelm.

Dr. Linsley exhibited a series of bees and their parasites that had been collected in Southern Mexico. The principal bee species was an anthophorid of the genus *Melitoma* which digs its burrows in cliffs; while the other bee species borrow the old burrows of *Melitoma*. The most unusual of the parasites in this collection was a series of an apparently undescribed species of Mantispid reared from the cells of the *Melitoma* sp.

Mr. Leech passed around the June, 1953, copy of a Japanese entomological journal, Shin Konshu. in which there is an obituary, with portrait by Y. Nishio, of the late Dr. E. C. Van Dyke (vol. 6, No. 6, p. 8).

Mr. Leech exhibited a piece of balsa wood which had formed the pinning bottom of a cigar box, in constant use at the Academy for at least the past two years. On November 21, dust seeping out of it was investigated, and a series of dead adults and one live larva of a cassenine weevil were found. The beetles are unlike any from North America, and are presumably of notropical origin.

Mr. Leech also exhibited a box of beetles, showing the remarkable resemblances of various Tenebrionidae to species of ten other families.

Dr. Ross projected a number of color slides showing alkali bees of the genus *Nomia* in Utah, where they are important in the pollination of alfalfa, and their bombiliid parasites.

President MacSwain called on Dr. Usinger, chairman of the nominating committee, to present the slate of officers proposed by the committee for 1954. There were no nominations from the floor, and the following were elected: J. Gordon Edwards, President; W. C. Day, Vice-President; D. D. Jensen, Secretary; R. C. Miller, Treasurer; and W. H. Lange, Member at Large.

Dr. MacSwain then requested President-elect Edwards to assume the

chairmanship of the meeting. Dr. Edwards then called on Dr. MacSwain to give his retiring presidential address entitled "Some problems in larval and adult classifications of the Meloidae."

Dr. MacSwain pointed out that students of larvae and adults commonly disagree on the levels of classification to be applied to various groups within any one family and not infrequently tend to ignore the results presented from the other viewpoint. The Meloidae are no exception in this regard, and at the present time, two very different classifications are being used. The adult classification admits two subfamilies and nine tribes, while most larval classifications would separate the Meloidae first into two families, and secondly would divide the major family into four subfamilies and ten tribes.

He then discussed the habits of the adults and larvae which correlate with these two classifications and showed how, partially on the basis of new evidence, a single usable classification could be derived. Following the address, the meeting was adjourned.—D. D. JENSEN, *Secretary*.